THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY

Publishing Office, No. 42 Pine Street.

Devoted to the Interests of Illumination, Heating, Ventilation and Sanitary Improvement, Domestic Economy, and General Science. Including Water Supply and Distribution.

VOLUME XXIII.—No. 10. Whole No. 394. | NEW YORK. TUESDAY NOVEMBER 16, 1875. | $3 PER ANNUM IN ADVANCE.

Third Annual Meeting of the American Gas-Light Association.

HELD AT MASONIC TEMPLE, NEW YORK, OCTOBER 29TH 1875

[Continued from page 165.]

The President—Are there any other speciel committees to report?

The Secretary—None that I know of. I believe not.

Mr. Neal—I suppose it is now the proper time to proceed to the choice of officers for the ensuing year.

The President—That is the next thing in order.

Mr. Harbison—Before proceeding to the election of officers, I would suggest, sir, in regard to the Treasurer of the Association, whether it should not be decided that the compensation for his services shall be fixed before he is elected, because he may not be willing to serve for the amount we shall decide upon as the salary of Secretary and Treasurer. Most of us who are employed by companies on salaries, like to know how much we are going to receive from year to year, and I think the Secretary and Treasurer of this Association ought to know at the beginning what he is going to receive. I should like to ask if the Executive Committee have had this subject under consideration, and are ready to make any recommendations?

The President—I am requested to ask the Executive Committee if they have considered the subject of salary of Secretary and Treasurer for the ensuing year?

Mr. Dennison—That was before the Executive Committee in a meeting last evening, and after a careful review of the financial condition of the Association we found, as stated in the report, that we would have to draw upon the current year for the salary due the Secretary and Treasurer for his services during the past year. We therefore recommended that the salary be fixed for the past year at $250, with the understanding, however, that the Association could fix a greater amount for the coming year, if it saw proper.

During the current year it is believed that the duties of the Secretary will not be so great as they have been during the past year, but expecting that the Secretary and Treasurer of the past year would be re-elected, we had hoped and expected that the salary will remain the same for the coming year, and that the two together would he remuneration for his services. There will be, perhaps, $150 due from new members this year, which, if collected, will make the income of the Association about $850, and estimating the ordinary expenses at $500, there will remain $250 to be paid the Secretary and Treasurer Some think it should be more, both offices having been combined in one person.

The question was raised in the committee whether we should fix the salary for the coming year, or rather, recommend that a definite sum should be fixed; and it was deemed prudent by the majority of the committee, to leave the determination of that question to the Association. I think, with Mr. Harbison, that it would be better, perhaps, if the salary were fixed beforehand, then the person accepting the office would know what he is to receive, and there could be no reflection upon the Association for not paying what might be deemed a reasonable sum for the services rendered.

Mr. H rbison—In accordance with the reasons given by Mr. Dennison, I move that the salary of Secretary and Treasurer for the current year be $250, because there has been an unusually large amount of work for the Secretary to do during the past year; and perhaps $250 for services rendered during the past year, and $259 for the present year, when the duties of the Secretary will be unusually light, will about balance for the two years.

The motion of Mr. Harbison was stated by the President and carried.

The President—The election of officers is now in order.

Mr. Henry White—I move that the chair appoint a committee of five to retire and nominate officers for the ensuing year,

The President—It has been moved and seconded, that the Association select a committee of five to retire and nominate officers for the ensuing year.

Mr. Henry White—If the chairman will excuse me, I hope the committee will be appointed by him.

The President—I prefer not.

A committee of five was chosen by the Association, consisting of Messrs. Henry White, Price, Henry Cartwright, Dwight, and Sherman.

The President—Gentlemen of the Association: I have one favor ta ask of you, and that is, that you permit me to retire from this office, not that I do not feel honored, and very greatly honored in being chosen by you for this position which I have held from the beginning, but simply because of my health, which is, at times, very precarious, and because I do think that "honors should be easy." (Applause.) I therefore prefer that some other gentleman should take the office, and I will work as hard in the ranks as I would at the head of the column. (Applause.)

The committee on the election of officers retired.

Mr. Harbison—Mr. President: I would suggest, sir, that while the committee are deliberating, the members present give special attention to Article 28 of the Constitution.

The President—I am requested to call your attention to Article 28 of the Constitution, which is as follows:

"No member, whose annual payment shall be in arrears, shall be entitled to vote." (Laughter.)

The treasurer will be very apt to see who shall vote.

The Secretary—I am prepared to receive the annual dues of members. My son will take the money at the table, where receipts are already made out.

Mr. Price—I move that Mr. Harbison be appointed a committee of one to see that the Article is faithfully carried out.

The President—He can do it without appointment. (Laughter.)

The annual dues of members were received by the treasurer, and receipts given therefor.

The President—The reading of papers is now in order.

The Treasurer—We have not quite finished receiving dues yet. I wish the members elected this morning would step this way and sign the Constitution.

After this had been done the President said: Are the committee on the nomination of officers ready to report?

Mr. Henry White—Mr. President: The committee appointed to present a list of officers for the ensuing year, beg leave to report the following names:

For President—Gen. Chas. Roome, New York.

For Vice-Presidents—W. H. Price, Ohio.
Geo. B. Neal, Mass.
Prof. J. L. Smith, Kentucky.

Secretary and Treasurer—Chas. Nettleton, N. Y.

FINANCE COMMITTEE.

John S. Chambers, New Jersey.
S. P. Harbison, Connecticut.
Geo. A. McIlhenney, Washington, D. C.

EXECUTIVE COMMITTEE.

W. H. Denniston, Pennsylvania.
T. Littlehales, Canada.
Gen. A. Hickenlooper, Ohio.
Henry Cartwright, Pennsylvania.
William Henry White, New York.
Henry Stacey, Indiana.

The announcement of the name of Gen. Roome was greeted with applause.

Mr. Henry White—Mr. President: I will say on behalf of the committee, that the name of yourself was selected as the unanimous choice of all the members. Each member, in expressing his choice, not only named yourself, but stated that among all his acquaintance in this body, there was no one who could, like yourself, fill the position of President to the satisfaction and admiration of all the members of the Association. (Applause.) And while desiring to respect your wish to retire from the office, and giving full weight to the excuses you have offered, yet, sir, on behalf of all the members of the committee, (and I know I also express the feelings of every member of the Association upon this subject) we respectfully beg you to reconsider your declination of the office, and to accept the position again. (Applause.) I would also say, sir, on behalf of Mr. Price, a mem

ber of the committee, that by unanimous choice of the other members, he was selected as the Vice-President of the Association It was utterly impossible for that committee to select any one else for the office. I only say this in justice to Mr. Price, the modesty of that gentleman, being a member of the committee, preventing him from being heard. He protested against his name being used in this connection, but the committee overruled his very just views in regard to the matter, and I respectfully beg leave to present his name. (Applause,)

The President—According to the Constitution, the vote for officers must be by ballot. The Association will therefore prepare to vote in this way. I will appoint as tellers Mr. Taylor of South Carolina and Mr. Littlehales of Canada, to shew that we are united. (Laughter.)

Mr. C. White—I move that the Secretary be authorized to cast a ballot for the Association.

The Secretary stated that he cast his ballot for the names presented by the committee, and Mr. Littlehales announced that they were duly elected.

The President—Gentlemen of the Association: The names of your officers who have been duly elected for the ensuing year, have been read to you. Now, so far as I am individually concerned, I appreciate highly, as I ought to appreciate, this mark of your confidence, your respect, and your regard. I thank you most sincerely. I was equally sincere when I asked you to excuse me from serving another year.

There are but few members of this association who are as old as I am, but they have been engaged in this business for years. You have among you gentlemen of learning and of high scientific attainments, who follow the profession because they love it, because they know it is a most honorable profession, and in this position it would give them wider and more extended usefulness, therefore I was really in hopes that some such gentleman might have been chosen.

Many of you know that for the last two or three years I have been struggling with a painful and dangesous disease. I have traveled over this country and in Europe, and have sought by every means in my power to escape from a malady likely to take me away almost any instant. Still, as it has been your pleasure that I should serve you another year, if God gives me health and strength I shall do it (Applause), and with all the ability, all the intellect, all the energy, and all the truth which God has vouchsafed to me.

I love my profession. There is no one among you who loves it more. For forty years it has been the study of my life. It has cost me many sleepless nights, and I have no prejudice—not a particle (Applause). I am not carried away by any supposed improvements, or any startling inventions. I do not believe them. (Applause.) And although I am something over sixty-three years of age, I am not an old fogy (Applause). I learn lessons now and all the time from the common laborer in my works. The most valuable lessons in gas-making I have ever learned, and those that were the most useful to me, I learned in the retort house when I was a student and an engineer; and I learned them from the day laborers there, who knew ten times as much about the business as I did. (Applause.) I have no false pride. What I know I can tell in as few words as most men, and when you ask me a question that I cannot answer I am brave enough to say I do not know. (Applause.)

Now, matters of importance will be brought before you for discussion; while I am sitting in this chair no man will know, or ought to know what I think on one side or the other. My duty is to see that facts are fairly presented to you; to listen to your arguments, and give you every opportunity fully and thoroughly to explain, for the benefit of the Association, whatever you may have to present to it. That is my duty as a presiding officer and as an honest man. Therefore I desire that in all the arguments that may come before you, you will confine yourself strictly to the question. There should be no poetry in our business. It is a plain matter of fact business based on observation, study, experiment and experience. A mistake made by us may cost thousands of dollars to those whose property is entrusted to our care. Our directors know no more, as a general thing, of our business than we may know about building ships or bridges, or the affairs of Wall street. I thank God that I am not a financier. (Applause.) Therefore I say to you, gentlemen, that during these deliberations, while I am willing to give to any one who wishes to learn our business, all the information I can, I would be fair and square, and I hope modest, in the expression of my opinions. I wish you to be the same, and that you shall be noted just as much for your intelligence and for the soundness of your judgment, as any association of scientific men can be. Let us, therefore, discard all idle theories and attend strictly to the matters before us, giving to every member of the Association, or to any one who may be invited to be present with us, every opportunity to explain his views. I shall insist upon everything being confined for the moment to the simple question, and see that you do not wander away from it. Please let all eloquence go. That is the kind of gas we do not want here. (Applause.) Therefore confine yourselves strictly to the business before you, for we are a business association. If we do this, then we will go home feeling glad that we met with each other and consulted each other, and worked together for the general good.

Gentlemen, I thank you most sincerely for the honor you have this day conferred upon me. (Applause.)

Prof. Chandler, of the School of Mines of Columbia College, and President of the Board of Health, a distinguished chemist and a man familiar with gas-making, will deliver a lecture to this Association in this room at 8 o'clock to-night, and I hope that he will make some experiments. I trust that a large proportion of the members will be present.

It is now within two or three minutes of 1 o'clock, and we have passed a resolution to adjourn from 1 until 3 o'clock. The Secretary requests that you will be here as promptly as possible at that hour, because there are subjects of general interest to be brought before you.

The President then declared the Association adjourned until 3 o'clock, P. M.

AFTERNOON SESSION.

The association met pursuant to adjournment, and was called to order by the President.

The President—The next business in order is the reading of papers.

Mr. C. White—Mr. President: Before that part of the business is taken up, I would like to make a motion in furtherance of one of the resolutions offered this morning, in regard to the death of Messrs. Everett and Miles, and it is that those resolutions be properly engrossed, and attested by the secretary of this association, and a copy be sent to each of the families of the deceased gentlemen. Carried.

Mr. Neal—I have the applications of five more persons for membership.

The President—The Secretary will please read them.

The Secretary then read the names of the applicants.

Mr. Neal—I move that the same course be taken as was adopted in the previous applications.

The President—You have heard the motion, gentlemen; but bear in mind that if there is any objection, we must cast the vote according to our Constitution.

No objection being offered, the motion was carried.

Mr. Neal—Mr. President: I do not wish to take up the time of the Association, but I wish to say that among the names read by the Secretary is one of a person who applies for membership as a secretary. I supposed, of course, that the By-laws read in that way; but I discover that they do not. The IV section reads as follows:

"To be eligible as an active member, a person must be a president, vice-president, director, treasurer, engineer, consulting engineer or superintendent of a gas company, or an individual manager of a gas works, or a person practically skilled in the construction and management of gas works."

Now, the question is, if a person applies in any other capacity, is he eligible? I think it would be well to change the By-Laws so as to admit a secretary. For the present, however, I would move that the word "secretary" be struck out of the application, and the word "manager" inserted in lieu of it. Carried.

The President—The Secretary will now proceed to cast a ballot in behalf of the Association, for the gentlemen whose names you have heard read. Mr. Neal will act as teller.

The Secretary cast the ballot as directed, and Mr. Neal announced that the applicants were duly elected members of the Association.

The President—The reading of papers is now in order.

The Secretary—I present to you a paper, by Mr. J. Desha Patton, of Pennsylvania, which I read at his request. The paper is entitled:

ON THE USE OF PETROLEUM AND ITS PRODUCTS IN THE MANUFACTURE OF ILLUMINATING GAS.

My experience with petroleum in gas-making has been almost entirely with that form or grade known as naphtha or benzine; nearly all the other forms—except residuum—I have tried experimentally, with one general result, viz.: That the heavier the oil used the lower would be the candle-power, and the higher the yield in bulk, and the greater would be the heat required to convert it.

Taking, then, that form with which I am best acquainted—commercial benzine—I will state as the results to be obtained from it, a yield averaging about 70 feet of gas per gallon of oil, and about 70 candles as the average standard of the light. This is what may be expected in constant running day after day. By no means have I ever been able to exceed 100 feet per gallon; and I can only obtain that by destroying a large part of the illuminating power of the gas. Nor have I ever been able to manufacture a less quantity than 56 feet per gallon, and that only by using so low heats, that a considerable portion of the oil would be unconverted. A yield of 70 feet of 80 candle gas, or 80 feet of 70 candle gas, is the highest result in *light and value* I have ever obtained or seen from a gallon of ordinary benzine; and I claim that no materially higher yield is possible, because either 70 feet of 80 candle gas or 80 feet of 70 candle gas weighs just about the same as the gallon of oil.

The amount of fuel required for the conversion of a barrel of oil is about 7½ bushels of coke—in practice—so that the cost of 3,000 feet of oil gas, in material, is that of one barrel of oil and 7½ bushels of coke.

The gas thus made stands all tests that coal-gas will, and actually contains less condensible matter than good coal gas does. It carries in the pipes and remains in the holder with less deterioration, and reaches the burner in just as good condition as the most orthodox coal-gas.

The retorts I have been using last from three to nine months—say six months average—and cost to renew about $90 per bench, or about 50 cents per day making 6.000 feet in 24 hours. This adds eight cents per 1000 to the cost of the gas for retorts.

Present average prices in Pennsylvania for oil and coke are about six cents per gallon, and 10 cents pe bushel, respectively, so that we have—

For 42 gallons of oil.....	$2·52
" 7½ bushels of coke.....	·75
Renewals of retorts.....	·25
Making for 3,000 feet of gas.....	$3·52

or $1·1733 per thousand, exclusive of labor and interest, as the cost of 70 candle gas.

The labor required may be safely stated as less than one-half of what would be required for an equivalent amount of coal gas; and the cost of coal-gas, in material and repairs in Pennsylvania, would be in the neighborhood of 90 cents per 1000. Leaving in round numbers the cost of oil gas 25 per cent.

greater than that of coal gas in materials, which would be, in great part, compensated by the saving in labor; but would still leave a balance of some cents per 1000 against the oil gas. A difference that in the case of new works would be much more than made up in the diminished cost of construction.

The use of this gas as I have used it in new works, where a price proportionate to its actual value could be obtained, is easy; and the consequence is that a good and cheap light can in such cases be profitably furnished by it. But the point of interest to established companies is—How can there be any economy to them in the use of oil gas? Even if it could be made and furnished into their holders for nothing, it would involve them in financial loss if they were (as public opinion demands) to sell the 70 candle gas at the price of 14 or 16 candle gas, because their consumers would be obliged to use small burners, and the total consumption, in money value, would amount to less than present profits; and, therefore, no matter how cheaply 70 candle gas can be made, the established companies cannot use it alone, without a change in the standard of price that would be difficult to make.

To quote from my pamphlet published early in the present season:

"From my point of view your consideration of this matter involves not so much the advancement of your position as the holding of it.

"The position of all large and well-managed gas companies is financially as good as they can hope to make it. You cannot well increase your percentage of profits without eliciting public clamor and opposition, and the advantage which you can expect from improved methods of gas making lies in the line of such improvements as will enable you to furnish a cheaper light to your consumers.

The difference in favor of oil gas, as compared with coal gas, is owing principally to its greater richness, and if you can render available to yourselves and to your consumers this greater richness you will receive all the benefits that the use of oil can give you.

"How to do this to the best advantage is therefore the question for you to solve.

"I will state first: That you cannot, with continuous success, make petroleum gas in the same retorts, and at the same time, with coal gas or any other gas. Even the different grades of petroleum require different degrees and different quantities of heat to convert them, and would differ still more from other materials in that respect.

"Second: That petroleum and coal are the only materials in common use that are capable of yielding illuminating gas, and I consider the manufacture of any non-illuminating or dilutant element a temporary subterfuge only, and nearly or quite as costly as a low grade of coal gas.

"My experience and observation satisfy me fully that these statements are correct, and if so they are insurmountable objections to at least three-fourths of the so-called "petroleum gas" schemes, and leave none to be considered except those that make gas from petroleum alone, and use it either pure or mixed with coal gas."

This reduces the consideration of the matter, so far as the established gas companies are concerned, to a single point:—Can it be used profitably in connection with coal gas?

My experience in this matter shows that it can; that the use of 8 or 10 per cent. of oil gas for enriching, will result in a saving equal to the difference between the prices of regular gas coal and common bituminous coal, or somewhere about 20 cents per 1000. The actual results in one case, where Westmoreland coal at $6.90 had previously been used, in iron retorts, without an exhauster, gave a yield of 4½ feet to the pound, averaging about 15 candles in quality. The introduction of oil was followed by the use of Morrisdale coal, at $4.61, without any noticeable difference *in quantity* of the yield from the coal alone; and the addition of eight per cent. of oil gas, produced a mixed gas of 17 candles, with the financial result of saving very nearly the entire difference in the price of coal, or about twenty cents per thousand feet on the entire yield. I understand that the difference in the price of gas coal and ordinary bituminous coals in New York, is not so great as in the instance above stated.

In such case about the same general result may be obtained by using Westmoreland coal, and running it as low as possible, without regard to the candle power, or, in other words—work out of your coal all the gas you can get, and enrich it up to whatever standard you desire, with gas—*not vapor or imitation of gas*—made from petroleum. In this way you can get 13,000 feet of good sixteen candle gas out of a ton of coal, and 16 gallons of oil; or, one ton of coal and 32 gallons of oil would give you 14,000 feet of 20-candle gas; or, again, one ton of coal and one barrel of oil would yield 15,000 feet of 24 candle gas. Thus the coal gas companies can mix a small portion of oil with their coal gas, to their own advantage, and without loss to their consumers; and they can mix additional quantities of oil gas with their coal gas to the advantage of their consumers, and without loss to themselves.

So long as it is considered a financial necessity to use bulk as a base, or as an element of value to illuminating gas, that variety of bulk which, all things considered, is the cheapest and least injurious to light, to meters, and to public health, is the one that is needed; and it is yet to be shown that in economy or desirability any cheap gas yet produced is capable of taking the place of coal gas. If a strictly or nearly pure hydrogen gas could be made, stored and delivered, at about one-half the price of 8-candle coal gas, or one third the price of 16 candle coal gas, it might be made a desirable base; but until this can be done, I believe that the saving to be expected from the use of oil gas in established works is confined to the figures I have given, unless they feel sufficient confidence in their consumers to say to them—"We are going to furnish you with 70 candle gas which, at $10 per 1000, is cheaper to you than the gas we have previously furnished at $3.00."

In closing, I wish it understood that the figures I have given are those of actual experience in continued working, and not of a series of experiments, and that I am addressing only those who will recognize in my statements a desire to contribute to the general fund of information, my quota of experience with exact truthfulness. And if it seems to any one here that I have not been explicit enough in statements of detail, or have not met some of the many erroneous objections that have been made to oil gas, it should be remembered that there are many causes of bitterness that could easily be awakened, and probably would be had I undertaken to explain any particular mode of oil gas making, or to relieve the oil gas system generally from the stigmas cast upon it by the faults of its advocates.

If any specific questions seem desirable, I will do my best to answer them and will do so cheerfully.

J. Desha Patton.

The President—You have heard the paper read, and it is now before you for your consideration.

Mr. Neal—Mr. President: In his paper Mr. Patton uses the expression "a ton of coal"; up our way a ton of coal, for gas purposes, weighs 2240 lbs. I am told that he estimates a ton of coal at 2000 lbs. I would like to have that answered, as it would make a great difference in the estimate.

Mr. Patton—I mean 2240 lbs.

Mr. Olney—I would like to ask one question, and that is—if the oil was vaporized by being dropped into the retorts after the old-fashioned rosin process? I believe that most of our engineers are familiar with that process. Now, I would like to know if this oil was converted into vapor, *i. e.*, into gas, by coming in contact with heat after any other method than the one I have mentioned?

Mr. Patton's reply was inaudible to the President, who said:

Gentlemen; if you are going to question Mr. Patton, I will ask him to step forward upon the platform where all can hear him.

Mr. Patton came forward, and took his seat on the platform, as requested.

The President—Mr. Olney please repeat your question.

Mr. olney—As I understand your report, you state that, under a high heat, a large proportion of your oil was converted into solid carbon. In what manner did you bring the oil into contact with the red hot surface, if that was the form used?

Mr. Patton—It was droppod into the retort.

Mr. Olney—Under those circumstances you found that a portion of the oil so burned was converted into solid carbon, and at a lower heat became condensed. Was that your experience?

Mr. Patton—Yes, sir.

Mr. Littlehales—I would like to know how you ascertained the quality of the gas? What kind of burner was used? Was the photometer applied, or is it simply an estimate?

Mr. Patton—It was a one foot burner, and the photometric test was applied, and the results were compared to the amount of gas that ought to be allowed under the regular test. That is to say, if one foot of gas gave a lighting power of 14 candles, five feet, the regular allowance for a burner, would give the light of 17 candles. The tests have also been made by a 2½ inch burner—an open tube or ordinary Argand burner.

Mr. Littlehales—Could you take off the one foot burner, and use the 2½ inch burner; would that be possible with the pressure?

Mr. Patton—I would not take it off until the best portion of the consumption was done, that is, when it was turned up as high as it would bear without smoking.

Mr. Littlehales—How was the result as to the amount of gas?

Mr. Patton—With an ordinary Argand burner, one foot would give a light of 14 candles, and coal gas, under the circumstances, would have required five feet to make a 14 candle gas, therefore the oil gas had five times the illuminating power of the coal gas.

Mr. Allen—I understood you to say that in testing the light you registered one foot, and found that to be 14 candles; and from that you estimated that at five feet, the standard, it would make 70 candles.

Mr. Patton—Yes, sir.

Mr. Allen—According to the photometric test, five cubic feet of gas will give 17 candles, 2½ feet will give about one candle, so I think that if you found a 14 candle gas there, you must certainly have had at least 15 feet to 200 candles. Seventy candles would not be a result. The ordinary London gas of 10 candles, if burned in 3½ feet, will produce only 4½ candles. 2½ feet gives 1 2-10 candles.

Mr. Patton—The only way in which I could arrive at practical results, was that which I have stated.

Mr. Allen—With the specific gravity of the oil gas, which you estimate at 70 candles, did you at any time take the specific gravity of the air? If you could tell us that, it would be some criterion to go by.

Mr. Patton—The test was taken and was a specific gravity of 9·35 of air to 1000 feet.

Mr. Allen—Can Mr. Patton give us the weight of the mixture he speaks of in his paper?

Mr. Patton—No, sir.

The President—I wish to say to you gentlemen, that these tests were based on simply a one-foot burner. He did not mix it with another gas of known quality. His calculations were simply made on a batwing burner burning one foot an hour. He dtdn't arrive at any result from using his gas mixed with any other gas.

Mr. Allen—How much was the specific gravity of the two gases mixed that you speak of? That is an interesting point to us.

Mr. Patton—I think a mixed gas containing 10 per cent. less of oil gas would probably weigh less than half.

Mr. Allen—In reference to the price actually obtained per thousand for this gas from consumers at different points. For instance, coal gas is sold at $3 per thousand What is the actual price obtained for this gas?

Mr. Patton—The price charged for pure gas has been $10 per thousand, and the fact that the gas is not higher in proportion than coal gas at $3 per thous-

and, is generally acknowledged among the consumers of oil gas. The burners are one foot burners.

Mr. Price—This gas, consumed by persons using it at the rate of one foot an hour, for which $10 per thousand feet is charged, is considered by them to be about equivalent to a 16-candle gas consumed in a 5 or 6 foot burner, and sold at the rate of $3 per thousand feet.

Mr. Patton—Yes.

Mr. Littlehales—One other point comes up, and that is this. How would the leakage affect the production of this highly illuminating and high priced gas. If you are producing a certain number of thousand feet per day of 70 candle gas, costing, perhaps, $4 or $5 to make, then the leakage would be a very serious item, and I think that would be a very grave objection to the manufacture of such a high priced gas. How would it affect the result?

Mr. Patton—I am not prepared to answer that question, as I try to have as little leakage as possible.

Mr. Allen—You think a diluent in gas is a greater detriment than the reduction in size of the burner? That is, you think a pure gas burning one foot an hour, is a better gas for consumption than having a diluted gas burning in a 5 or 6 feet burner?

Mr. Patton—I did not say so.

Mr. Allen—That has been your theory, has it not?

Mr. Patton—I didn't say so; I did not touch upon that point.

Mr. Allen—Didn't you speak of a diluent being a detriment?

Mr. Patton—I said I regarded a dilutant as only a "temporary subterfuge."

Mr. Allen—What do you call a diluant or "dilutant," as you express it?

Mr. Patton—A gas that costs money and don't give any light.

Mr. Allen—How much of coal gas is of that quality?

Mr. Patton—About 90 per cent.

Mr. Allen—Then you condemn 90 per cent. of common coal gas?

Mr. Patton—No, sir.

Mr. Allen—What else is it?

Mr. Patton—It is something inseparably connected with the manufacture of coal gas.

Mr. Allen—But common coal gas has 90 per cent. of diluent, or non-illuminating power, has it not?

Mr. Patton—I said so.

Mr. Allen—Can that be got rid of if you make a gas out of coal?

Mr. Patton—I suppose not. You can answer that question as well as I can.

Mr. Allen—Then you must condemn all coal gas, must you not?

Mr. Patton—No, sir.

Mr. Allen—But if the diluant is a detriment, and common coal gas has 90 per cent. of a non-illuminating substance in it, why, it should be condemned, should it not, according to your theory?

Mr. Patton—No, sir, I did'nt say so; the trouble is you must have something besides coal gas.

Mr. Allen—You think common coal gas of 14 candles is better than tallow candles—don't you?

Mr. Patton—I think so, simply because it has something in it which makes it give light.

Mr. Allen—Your theory is that you ought to hrve a gas which has no non-illuminant in it?

Mr. Patton—No, sir.

Mr. Allen—But I understood you to say that a non-illuminant is a "dilutant," as you call ft. A non-illuminant in gas *is* a diiuant, is it not?

Mr. Patton—The expression I used in the paper, referred to the manufacture of gas and the manufacture of these dilutants, and not the fact of their being a necessary element in the manufacture of light. There are e great many necessary evils that we must meet.

Mr. Allen—Suppose that a coal gas made from Westmoreland coal produces 93 per cent. of non-illuminating gas, that is a diluant, and that you could get another non-illuminant that was made at half the price and just as good as the other, would you condemn it?

Mr. Patton—I would rather not be asked questions directly over again that I have answered before. I have said then that if any pure hydrogen gas could be obtained at a reasonable price, it might be a desirable thing.

Mr. Allen—Pure hydrogen! Do you think pure hydrogen could be used in gas-making?

Mr. Patton—I did'nt express any opinion on it, sir.

Mr. Allen—Could you, in operating gas works, hold pure hydrogen?

Mr. Patton—I expressed some doubt as to whether it could be kept and stored at all.

Mr. Allen—I have had the pleasure of Mr. Patton's acquaintance through a discussion of this matter in the public press. Now, what I desire to say to Mr. Patton is simply this, whether or not, if there is a diluent in coal-gas it is a detriment, and to say if another diluent or 'non-illuminating gas of a permanent character could be made for one half of the cost of the other, whether he would say that it was a detriment.

Mr. Patton—I have answered those questions very distinctly once. I stated what I thought about pure hydrogen.

Mr. Allen—You aretalking about something that is not to be obtained in a practical way. I am not talking about pure hydrogen, I am talking about a diluent gas, permanent in its nature, being substituted for the diluent produced by coal; whether that would be a detriment.

Mr. Patton—If Mr. Allen will remember, I simply said that if pure hydrogen gas could be had at a certain price, it would be desirable. I did'nt express any opinion as to whether there was some other gas. I don't know anything about that.

Mr. Allen—Did you ever hear of any other diluant?

Mr. Patton—Yes, sir.

Mr. Allen—What is it?

Mr. Patton—Air.

Mr. Allen—Do you think air is a good diluant?

Mr. Patton—No, sir, I do not.

Mr. Allen—Does it follow that there is no other diluant?

Mr. Patton—There is no other that I know of. If Mr. Allen knows of any I should be glad to hear from him.

Mr. Libby—Did the gentleman ever hear of water as a diluant? (Laughter.)

Mr. Allen—I am glad my friend mentioned that. It makes a pretty good diluant sometimes—a little of it. As I understand Mr. Patton, he condemns all non-illuminating gas as a diluant, and I think I show pretty clearly, and he has said here that any coal-gas, or the great bnlk of it is non-illuminating, and consequently a diluant. Now, I want to see how far his knowledge extends. Mr. Patton, have you ever tried the effect of the decomposition of steam in making gas.

Mr. Patton—No, sir, I don't know anything about it.

Mr. Allen—I don't think your knowledge will affect us much.

Mr. Patton—Probably not, sir.

Mr. Libby—Mr. President: I object to the witness being bully-ragged. (Laughter.)

Mr. Neal—This discussion is very interesting, and I only wish that Mr. Patton had a little stronger voice so that we could hear him more distinctly,, and he could talk without weariness; but I think our friend Mr. Allen has not quite comprehended the situation. Mr. Patton has put his paper before us as what he thinks. We may not all agree with him, but the paper is submitted as his opinion, and we can, if we choose, discuss it among ourselves; but I don't think he should be subjected to a cross-examination, such as we have just heard.

A Member—Louder; there is too much diluant in your voice. (Laughter.)

Mr. Neal—Mr. Patton merely presents that paper as his opinion upon a particular subject. It may be worth someahing to us or it may not be worth anything, and I hope Mr. Patton will not be pressed to speak any further in this direction. (Applause.)

The President—Gentlemen, do you wish to ask any further questions?

Mr. Price—Mr. President: I wish to ask if it is in order to make any comments or critisisms upon the position taken in the paper?

The President—That is what we are here for. We met here expressly for that purpose, to have gentlemen present their views, and give them every opportunity to explain, then to advance all the objections and criticisms that may occur to us, and discuss every point thoroughly. In this way we can learn something by coming together. Let us hear your comments, Mr. Price. (Applause.)

Mr. Price—For one; I was very much interested in the paper, so far as I could hear it, and I regret that it was not distinctly read. I feel very grateful to Mr. Patton for the manner in which he has presented it as an advocate; he has not presented it as a man who has a patent right to sell (Applause), but he has presented it in a manly and dignified way. For my part I was very much pleased with it. I apprehend that the great trouble with our friend there is that Mr. Patton differs from the process to which he is committed, ane the patent right of which he has for sale.

The President—Gentlemen: Don't let the discussion take that line, just argue the merits of the case. Let pytent rights and things of that kind go, we have nothing to do with them here. (Applause.) We should not impugn gentlemen's motives. That is not a question for us to decide.

Mr. Price—I have no intention of impugning any one's motives, but I do object to the kind of cross-questioning that was indulged in with regard to Mr. Patton's position. He don't undertake to say that certain things are not true, but he only undertakes to say that certain things in his experience he has found to be true. He has talked upon one point in the paper which I think is a fallacy. Mr. Patton has spoken of the advantage of using gas made from petroleum, as an enriching matcrial as well with poor coal. Now, I hold it to be almost invarirbly true. and I can hardly conceive of a case where it is not true, that a poor coal with certain qualities about it which render it unfit to be used, is not worth anything in the manufacture of gas. And we can hardly conceive of a coal good enough to make gas, which is not rich enough to produce the proper amount of light.

He has spoken of a case of two coals, Westmoreland and some other coal (I did not get the name) where one produced as much volume of gas as the other, but one was deficient in illuminating power. I apprehend that such a state of facts cannot be found. If you find gas that is poor in illuminating power, you will generally find that it comes from coal that you cannot use in the gas works. Either it will be so lean that the product will not be profitable, or it will be making very poor coke, or it will be impossible to purify it, so that the case must be an exceptional case.

I can find plenty of cheap coals, but they will not answer the purpose. Here is one kind of coal, but it is so poor, and thin and lean, that it don't give more than 3½ feet to the pound, so I cannot afford to use it. Here is another coal of good quality and gives a brilliant gas, but the coke is so poor I cannot keep up my fires with it. And here is another coal that may make good coke and gas, but it costs too much to purify it, and so I cannot afford to use it. Therefore poor coals are out of the question. They are not worth enriching. They are worth nothing in the gas works. The only coals that are fit to make gas with are those that the addition of a very little cannel, make as good gas as any community need wish to have. So that if any one sets up petroleum works with the expectation of buying cheap coal to be used in connection with them he will be disappointed. (Applause.)

Mr. Olney—I will give you a little practical experience in the use of coals. I have used English coal which produced 3½ or 4 feet to the pound. In 1852 I used a coal that would produce on an average four feet, and made a gas which was then considered 16

candle, and we had to add 25 per cent. of cannel. We have now a coal that produces 4½ to 5 feet and the illuminating power of the gas is 13 or 14 candles, but before using it we have to mix a large per cent. of cannel with it. I have also used the coals that come from those West Virginia mines on the James river.

I am speaking practically of what I know. Twenty-five per cent. of cannel added to these coals, at the present price of cannel coal, makes the gas produced a very expensive one. Gas produced from those coals and coke, is equal to the gas produced from the best coals we have. Now, to take a small proportion of petroleum and add to these gases, I find that it becomes very much cheaper and better than by adding cannel, or the best kind of coal that can be produced. I merely state these facts because it has been said that there are some coals which are utterly worthless for the purpose of gas manufacture.

There is another point I wish to speak of, and that is in regard to the storage of coals. They depreciate very much in value if they are stored for a long period of time. They should be kept in perfect darkness. Coals that are exposed require a much larger proportion of enriching material, either from petroleum or cannel than those which have not been exposed. The question of petroleum is one that is a good deal talked about. At the prerent time petroleum is in such a shape that it can be used in a way that works instantly, and produces better results.

The President—I would like to hear from some gentleman of the Association who are using a cheap or inferior grade of coal like Lingan. I believe some of our friends down east use this coal at their works, and I should like to hear their experience.

Mr. Neal—I object to those two words "Down East." (Laughter.) I live in the city of Boston, and everybody knows it is the "Hub" around which everything revolves. Even the village of New York, by and by, will pass around in order. But that has nothing to do with the question before the meeting, or with what is suggested by reading of the paper.

I use one third Lingan coal, and I mix it with Westmoreland or Youghiogheny coal; and, so far as my experience goes, I think Mr. Patton made a mistake in thinking it was very poor. It has a very good illuminating power, perhaps 13 or 14 candles. When used with Westmoreland and other first-class coals it produces very good results. I heard very good reports of its use from the Manchester gas company, and that is the reason why I began to use it. I think it makes a very good diluent for coal gas, but for naphtha or petroleum gas I don't think it is pure enough. I know there are some coals that are very cheap; but when they come to be used there is a great deal of sulphur in them, and other impurities that make them less valuable for use.

While I am up I will say that the President of the Lexington Gas Company informed me that they were now using the Butler process, that is, clear petroleum, and that they charged $12 a thousand where the gas is very good and rich. Gas in that place had been sold before that process was introduced at $3.00, and he told me that it cost the consumer, for the same given amount of gas, just about the same at this price as the Charlestown coal gas at $3.00.

I will simply state that Manchester and Concord are the only companies using Lingan coal to any great extent. The Manchester company use it in the proportion of 5,000 tons to 2,000 tons of Penn. They use it chiefly in winter. Their result is 9,090 feet to the ton, of 14 or 15 candles, which I think is the result generally obtained in the use of Lingan coal.

[To be continued.]

The consumption of petroleum in Japan is reported to be very large, and shiploads are received from America. Japan, however, possesses naphtha springs in her territory, and some time since a Japanese engineer was sent to Pennsylvania to obtain information relating to the process of production and preparation. His son is still in the States purchasing the necessary machines and perfecting his studies of the subject.—*Jour. Society of Arts.*

Correspondence

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Ed.

Letter from Mr. Allen.

New York, October 23, 1875.

Mr. Editor: I suppose that many of the members of the Gas Association, at the late meeting, did not understand my reasons for the questions I put to Mr. Patton upon the subject of his paper read there.

Mr. Patton had previously, in his publications in advocacy of "oil gas," assumed grounds which I do not think can be sustained by any man. He claimed that "*any non-illuminating or dilutant element*" in gas is "a *temporary subterfuge* only," and after I had replied, showing him the utter fallacy of his assertion, he repeated the same error, laying it down with still more assurance, as one of the "fundamental rules," that not only the admixture of *air*, but also that "*any other dilutant element* with gas has still more hurtful effect than diminishing the size of the burner."

My reply to him, published in the *National Oil Journal*, Pittsburgh, September 15, 1875, will explain the matter more fully. Yours, etc.,

H. P. Allen.

Lime Purification.

Wilmington, Del., October 20, 1875.

Mr. Editor: In view of the interest manifested of late in the paper read by Mr. Forstall, at the meeting at Washington in May, on "Lime Purification." and anticipating an exchange of views at the late meeting, I thought it might be of some interest to present the result of my experience, short though it be.

I will at once state. that so far I have failed to discover any superior absorbent power in its use as now pregared, over that prepared in the ordinary way, or that state of hydration which has heretofore been recommended as best adapted for the removal of impurities. There are, however, other results flowing from its use, which strongly recommend it, in my opinion, to gas manufacturers.

The results are these: First—Eeconomy of labor in the purifying department, inasmuch as one bed as now used, will do the work of two or three as heretofore in use. Secondly—The entire absence of foul vapors at the opening of the beds and during the time of cleaning the beds of the foul lime, and as a consequence no disagreeable odors pervading the immediate neighborhood, and impinging upon the nasal organs of the community. Thirdly—The pressure in the beds is reduced to nil. These are good results, for which Mr. Forstall is deserving of our thanks.

There is a point in the hydration of lime beyond which it ceases to be operative on the impurities, particularly sulphuretted hydrogen. I find the state of its maximum activity to be about that state of hydration generally recommended and used by the profession at large. The additional lime and water used give the above results, but the quantity of gas purified is about the same.

I take, for instance, a bushel of unslacked oyster shell lime weighing 54 lbs., to which I add from 38 to 40 lbs. of water; in this state it is fit for use, as generally recommended. With this preparation I have, for an extended period of time, purified 6,580 cubic feet per bushel. The past season I have used about 58 lbs. water per bushel, and in this condition I have averaged so far 4,380 cubic feet per bushel; the coal in both instances was the same—Penn and Westmoreland.

These figures would lead to the conclusion that by the latter process there is a gain of 800 feet per bushel. Such is not the case; there is an apparent gain of 12 per cent., but on the other side there is a difference of 13 per cent. in the amsunt of lime used. A bushel of unslacked lime, when prepared as heretofore used, is 13 per cent. larger in bulk than when prepared as now used. By the additional water the lime is made to occupy less space, and consequently more lime is contained in a given space.

I have, not long since, experimented to see to what point I might saturate the lime with water, and note the results. I found that a very small quantity more of water than that which I now use, caused the lime to be entirely inoperative; the sulphur compounds passed through the clean beds as if there was no lime in them,and indeed, before I had the beds refilled, passed to the holders and street. I will further say that I was using the lime during the Summer and Fall of 1874 the same as now, without, however, using any additional water, and the amount of gas purified was the same as now. I quit it in the same winter on account of the excessive pressure in the beds, but intended to resume some experiments with it, the following summer. I read Mr. Forstall's paper in the mean time, that ended any experiments I might have thought of making, and at once took to the water. The result has been satisfactory so far. Yours, etc.,

Thomls Curley,
Sup't Wilmington Gas-Light Co.

Street Loss of Gas.

Knoxville, Tenn., November 6, 1875.

Mr. Editor: In Mr. Smedberg's communication in the last issue of the Journal, I notice a statement which certainly surprises me. He says, "I have few data of American street loss as yet, but among them I find: 1st. A company selling 10,400 cubic feet per ton. 2nd. One selling 10,000 cubic feet per ton. 3rd. A street loss of but 5 per cent."

Now I had no idea that any company in this or any other country had attained to such results. I would consider such figures as the above, splendid working at the station meter, for I sm supposing that these companies are using the average American coal, and selling the average American gas, say 16 candles. I candidly confess that although my greatest desire is to attain to such results, I have failed to do it, and therefore I would respectfully request that the engineer of that company who *sells* 10,400 cubic feet per ton, would through your columns tell us how he does it, I would look forward to such a communication with far more interest than even to the report on naphtha gas; for if one company can show such splendid working, what is to hinder another company from doing it, And if it can be done, I venture to predict that very soon that great desideratum, cheap gas, will fyllow. Trusting soon to hear more about this,

I am yours respectfully,

James Somerville, Sup't.

How Flames Become Luminous.

Professor W. Stein, in a recent number of the English *Mechanic*, thus intelligently discourses on the Luminosity of Flames.

The correctness of the old and well-founded conception that the light of flame is caused by incandescent carbon-molecules, has been disputed by Dr. Frankland, who contends and tries to prove that it is derived from hydrocarbon-vapors.

As proof of his ideas he mentions that the soot deposited on a cool surface, when introduced into a flame, does not consist of pure carbon, but that it contains also hydrogen; that, in fact, it seems nothing else than a collection of the densest light-giving hydrocarbons, whose vapors condense on the cold surface.

Against this we may mention that not only do the heavy hydrocarbons, but even marsh-gas, split up at high temperatures on exclusion of atmospheric air; and as the hydrocarbons, whose vapors are supposed to cause the luminosity of the flame, are precisely under such conditions before they come into contact with the air, it cannot be doubted that they suffer decomposition into carbon and hydrogen in the luminous portion of the flame. It is of little importance whether the eliminated carbon is chemically pure, or whether it contains still a hydrogen compound; the important question is this—Is the soot held by the flame in the shape of vapor or in the solid form? If

the soot was nothing but a conglomeration of the densest light-giving hydrocarbons, whose vapors condense on a cool body, then, when sufficiently highly heated by exclusion of air, it ought to reassume vapor-form. This is, however, not the case, as every one will find who tries the experiment.

Its chemical composition is just as little favorable to Frankland's view. It ought, presumedly, to vary according to the lighting material from which it was derived—nay, even according to the place of the flame wherefrom it was deposited. It is well known that the temperature of the flame varies in various places, and Magnus's experiments have proved that from heavy hydrocarbons at a less high temperature a hydrogenous tarry product besides hydrocarbon is also eliminated. The soot, whose analysis I give, was obtained from a bat's-wing burner by allowing a small silver basin, filled with water, to dip for about two or three minutes in the flame. Benzine removed traces of a solid yellow body, but the small amount of it prevented its being further investigated. Alcohol, and alcoholic solution of caustic potash, and dilute sulphuric acid, dissolved nothing.

After being carefully and repeatedly washed with boiling water and dried at 130°, 0·206 yielded: Carbonic acid, 0·6685; water, 0·0195; ash, 0·0020—which amounts in 100 parts to—

	Containing Ash.	Free from ash
Carbon	96·446	97·490
Hydrogen	1·051	1·061
Ash	0·970	.....
Oxygen	1·533	1·533

I attribute the presence of oxygen to a small amount of water, which, even at 130°, was still retained, and this, when deducted, gives the composition of 100 parts of soot free from water and ash as consisting of carbon, 99·095; hydrogen, 0·905.

2. "How could the light of a flame be as transparent as in reality it is, if it was filled with solid carbon particles?" asks Dr. Frankland.

In reply to this, it must be admitted that one is able to read the writing held behind the flame of a bat's-wing burner. It is, however, easily observable that the flame is more transparent in the lower non-luminous portion. The reading also becomes more difficult through a flame of greater thickness, and impossible through the flame of a candle or petroleum burner. If, as is proved hereby, the transparency of a flame is only very limited, it may also be remembered that one can also read the same writing through media which are known to be filled with solid particles. The fact that solid bodies are by preference apt to become light-radiating is not at all changed by this, and thus far it is demonstrated only that there can be but one solid body to which the luminosity of flame can be attributed. If we consider, therefore, all the facts, we can draw only one conclusion, namely, that the light of our illuminating flame comes from incandescent carbon-molecules, and that the old view is still to be retained.

Experience teaches that, for the artificial production of light, a high temperature is requisite before all things. Temperature is, however, that part of the total heat of a body which influences the surrounding parts, or the surplus of atomic movement which is not consumed by its inner work. A high temperature means, therefore, a great excess of such movement, which again is identical with a greater number of momentary vibrations. In fact, the movement of light and the movement of heat differ essentially by regularity (*rhythmen*), and greater movement of heat passes, therefore, presumedly into movement of light, if it has reached the lowest number of vibrations for light, namely, those of red light. If, after a greater and greater rising of temperature up to its highest possible degree, the rapidity of movement increases more and more, we observe, besides the red light, first, yellow light, forming orange with the former; later, we meet also blue light, which, however, in most cases, only serves to form white light with the red and yellow, and which is only predominant in very rare cases, as observed by Deville. Under ordinary circumstances, we only get a yellow or red light containing more or less white. The more white it contains the greater is, naturally, its effect of light; and, as white only appears at the highest temperatures, it becomes evident that the temperature of a flame does not exert a secondary influence on its luminosity, but is its principal factor. The second factor is the eliminated carbon, the molecules of which radiate the light. The luminosity of two flames of the same temperature corresponds, therefore, to the number of its carbon-molecules, and "luminosity in general is equal to the product of the radiating molecules and their temperatures" for illuminating purposes, it may be presumed that the latter should amount to at least 1,000°.

The above-mentioned phenomena of light may easily be observed on solid bodies if heated. They are not observable on gases as long as they expand unhindered. It would, however, be wrong to attribute this negative behavior to the circumstance alone that, by the unhindered expansion, the amount of the added or produced heat was changed into power. This is contradicted by the high temperature which, among others, the non-luminous explosive gas-flame (*Knallgas*) possesses. Besides, it is also observed that platinum wire becomes incandescent in every possible non-luminous flame, even in a flame produced by nitrogen in coal-gas, if the requisite temperature to change heat into light is present.

If we may conclude from this that the atoms of gases may be brought into light-vibrations without becoming luminous, then we possess bodies which conduct the light (the gases), and others which radiate light (the solid bodies), just as we have conductors of electricity and idio-electrical bodies.

In a given space we find a much larger number of vibrating atoms if filled with solid matter than if filled with gas. The waves of light of solid bodies must, therefore, be much denser than those of gases, and exert also a more intense effect on the nerves of our eyes. "Light-conductors" differ, therefore, from "light-radiators" by the lesser density of their waves of light; for which reason they cannot, under ordinary circumstances, form "optical molecules," as I expressed on another occasion. How powerfully the condensation of the waves of light affects the eye is shown by the effect of collecting lenses.

Chemical and Scientific Repertory.

New Pneumatic Thermometer.—Mr. Gidley, of San Francisco, has invented a pneumatic thermometer, which registers the temperature in the coal bunkers of a ship, and thus enables preventive measures to be taken against the outbreak of spontaneous combustion.

To ebonize wood, collect lamp black from a lamp or candle on a piece of slate. Scrape off the deposit, mix with French polish, and apply to the object in the ordinary way.

Paper containing starch moistened with a solution of potassium iodate in oxalic acid and dried, is turned blue by reducing agents, such as sulphurous acid, hyposulphates, sulphuretted hydrogen, potassium sulphocyanate, ferrous oxide, cupric chloride, potassium iodide, and similar bodies.

Messrs. Bede & Co., of Verviers, Belgium, have recently introduced a new device for automatically controlling the supply of water to a steam boiler, which, they claim, insures a uniform height of water in the boiler, thus avoiding danger of explosion, and diminished pressure from too sudden or over feeding.

A machine, it is said, has been invented by a M. H. Huppinger for writing spoken words. According to the *Revue Industrielle*, this instrument, which is about the size of the hand, is put in connection with the vocal organs, and records their movements upon a moving band of paper in dots and dashes of the same sort as those employed in telegraphic writing. The person using M. Hoppinger's invention simply repeats the words of the speaker after him inaudibly, and the same words are then faithfully written out on the moving hand.

Sawdust can be converted into a liquid wood, and afterwards into a solid, flexible, and almost indestructible mass, which, when incorporated with animal matter, rolled, and dried, can be used for the most delicate impressions, as well as for the formation of solid and durable articles, in the following manner: Immerse the dust of any kind of wood in diluted sulphuric acid, sufficiently strong to affect the fibers, for some days; the finer parts are then passed through a sieve, well stirred, and allowed to settle. Drain the liquid from the sediment, and mix the latter with a proportionate quantity of animal offal, similar to that used for glue. Roll the mass, pack it in molds, and allow it to dry.

Superheated Steam Engine.—In Rounebeck, Bremen, an engine has been nearly completed by Herr Trossin which solves the problem, which for nearly thirty years has engaged the attention of inventors, of the utilisation of superheated steam in common engines. The answer to the problem has been found in the new application of a physical law, and the use of a peculiar lubricant. An engine working with superheated steam needs only half the ordinary amount of coal, the boiler and grate can be smaller by one-half, the supply of water by one-third, and the air-pump and condenser are equally reduced to half their usual space. The improvement has been patented in England, Belgium and other countries, and can easily be applied to engines of the existing type.

New Speaking and Hearing Trumpet for Divers.—An apparatus patented by Bremen & Co., of Kiel, and introduced for trial into the German Imperial Navy, not only enables the diver to communicate with those at the air-pump, but also to hear distinctly, to a depth of sixteen fathoms, every word spoken at the surface. The absolute safety of the diver being thus secured, it is expected they will be able to work for smaller wages, thus rendering their services available in many cases in which they would otherwise be too costly. It is said that the invention is very simple, and can be attached, without much expense, to any diving apparatus. The main principle involved is the application of vibrating metallic plates for the propagation of the sound, without, however, allowing them to come in contact with the water.

Tinning various Metals in the Humid Way.—The following method is given by Wegler: A solution of perchloride of tin is first prepared by passing washed chlorine gas into a concentrated aqueous solution of tin salt, and expelling the excess of chlorine by gently warming it, then diluting it with 8 to 10 times its volume of water, and filtering it, if necessary. The article, well pickled in dilute sulphuric acid, and polished with sand and a steel scratch-brush, and rinsed with water, is loosely wound with a zinc wire, and immersed for 10 or 15 minutes, at the ordinary temperature, in the dilute solution of perchloride of tin. When tinned in this way, it is rinsed, brushed with a scratch-brush, dried, and finally polished with whitening. This applies to tinning cast iron, wrought iron, steel, copper, brass, lead, and zinc.

Electric Photometry, by Werner Siemens.—*Le Gaz*, of October 15, contains an account of a recent discovery by Werner Siemens, whereby he applies electricity in the determination of the intensity of light. We translate the following paragraphs:

"Whoever has studied the subject of photometry must have been struck by the small development that this branch has received. * * * We know that all solid bodies, when heated, emit luminous or calorific rays in all directions. * * * The waves of the former strike against the retina and produce the sensation of sight. * * *

"When the eye receives the waves of certain

lengths, the sensations differ, and we saythat objects from which they come are red, blue, etc., according to the wave lengths. As the sensations from these colors are entirely different it is impossible to compare their intensity. * * *

"Photometry rests upon the principle of regulating the effect of two luminous sources to be compared, upon another object, in such a way that this object appears *equally* lighted by each. * * * It is to do away with the difficulties of doing this that Mr. Siemens has sought to apply electricity to measure the intensity of light, and has availed himself of certain curious properties of selenium. M. Sale has discovered that crystaline selenium conducts electricity better when it is lighted than when it is dark, and that the conductibility increases with the intensity of the light, and that the portions of the spectrum which act the strongest upon the retina are at the same time those which give the greatest electric conductibility to selenium. It was reserved for Mr. Siemens to overcome the obstacles to the utilization of these properties, which were the weak and uncertain conductibility of crystaline selenium, and the variation in the action of light upon it, as well as the destructive action of the calorific rays.

"By heating amorphous selenium almost to the fusion point, and then crystallizing, by cooling slowly, Mr. Siemens happened to obtain a modification of crystallized selenium which conducts electricity much better, is much more sensitive to the action of light, is almost unaffected by heat, and preserves its properties almost constantly. By placing between two flat spirals a metallic thread of this selenium, held by two plates of mica, Mr. Siemens has constructed a photometer, which, by the aid of a small battery or thermo-electric pile, produces currents strong enough to measure with great precision the relative intensisities of the most feeble lights. He places the selenium in a small tube; the extremities of the two spirals are joined by a small Daniels pile, and by the wire of a galvanometer. If we remove the cover of the tube, and cast the light of a gas flame upon the selenium, this body becomes a conductor, and the deviation of the needle of the galvanometer increases proportionately with the increase of the conductivity of the metal, and consequently with the intensity of the light."

If we then receive the light of a candle (or other standard) upon the metal, we have a different reading of the galvanometer, and the two intensities may be compared. By moving the candle till the needle marks the same deviation as it did for the gas flame, then the two intensities will be inversely as the squares of the distances of the two lights. By this method we have a photometer independent of the element of color. It would be possible to so arrange the instrument as to register the intensities of different lights graphically.

Gas-Light Intelligence.

United States.

The following are the officers of the New York Gas Light Company:

Thomas K. Lees, President.
Samuel Carter, Treasurer.
George W. Doane, Secretary.

Mr. Lees has been connected with the company for the past fifteen years as Secretary, and as Vice-President and Treasurer. Mr. Carter has been with the New Rork Mutual Company for the past two years as Auditor, and Mr. Doane, formerly with the Brooklyn Gas-Light Company as bookkeeper, was promoted from the cashier's desk.

The tank for the new gas-holder of the New York Gas-Light Company is completed, and Mr. Thomas Rowland has commenced putting up the holder. The brick work for this tank was all laid within 30 days. This is quick work, and it is unusually well done. The diameter of the tank is about 180 feet.

From the manifest of the steamer City of Waco, it appears that three hundred cases of petroleum were shipped on her from C H. M. & Co. to the P. and P. Gas-Light Company of Galveston.—*N. Y. Times.*

The laying of pipes to carry natural gas from wells in Butler count y, to themills in Sharpsburg and Aetna, Pa., is completed. Connections were made with the well on October 21st. The air having been exhausted from the eighteen miles of pipe the gas was turned on, and in twenty minutes was rushing from the other end of the line. Being lighted it burned with a flame forty feet high, and in the evening it lighted the towns brilliantly. The heat is shown to be double that required for the mills.

Great Britain.

The directors of the Chartered and the Imperial Companies of London have resolved to recommend the shareholders of their respective companies to consolidate forthwith.

France.

The *Moniteur des interets materiels* states that at Bordeaux experiments with a view to get illuminating gas from cork have been guided to a successful issue. The gas obtained is so good and cheap that the town of Nérac is to be lighted with it. Cork, waste cuttings, etc., are distilled in a closed vessel, and a gas is obtained whiter and brighter than that of coal. Its blue zone is less, and its density greater than that of common lighting gas.

Canada.

The price of gas in Montreal was reduced six months ago from $2.60 to $2.50 per 1000 feet.

Preparation of Lime for Purification.

Sir: The attention which the above subject is now receiving, both in this country and in America, proves that there is no matter connected with our profession, however simple, but may be improved by ventilation and comparison of notes.

I think I may safely say, for the engineers of this country, that we are not in the habit of regulating the quantity of water we add to the lime by any of the directions to be found in treatises, soch as its retaining its shape when crushed in the hand; for whether it would do so or not would depend on the amount of pressure employed as much as on the quantity of water used, and that the quantity of water to be employed is only limited by the capacity of the lime to hold it without becoming a paste.

While this is our knowledge, I think it probable that we do not all give the manipulatton of the lime the attention which it deserves.

I know that men more generally make it too dry than too wet, for I have often had to check them for doing so.

I know also that, if not watched, they will put the lime in looking wet enough, but not sufficiently cooled, so that much of the water may be carried away by the gas in a state of vapor; and, to prevent this, I instruct that, while the lime feels warm to the touch, it is not to be put in. Hence our practice is to slake the lime a day before we use it.

Very frequently I have found that the lime, slaked and finished, ready for the purifiers, wes found on the morrow to be quite too dry, and had to be further wetted.

I have also frequently seen, both in my own works and in the works of others, the lime came out of the purifiers quite dry and powdery, not having done half its work. We may therefore gain something by giving the matter more personal attention than it has had.

How is the lime to be got to hold the most water?

When the lime is slaked and cooled, apply water from the rose of a watering-can, not in a *douche* from a bucket: the former comes more like the gentle rain, which penetrates but does not sodden. Turn it over, and add more water in tne same way until it has as much as it can hold, when it will be all in nobules, and when put into the purifier, in a layer of at least six inches thick, it may again be watered as it lies; for, as it has not again to be touched, it can hold water and keep its shape, while more handling would convert it into paste.

A good test of when the lime has had water enough is when an inch or two in depth of water is found in the bottom of the dry purifier—not necessarily water that has dropped through the lime, but water that has been brought forward in a state of vapor from previous purifiers, and condensed on the cold bottom.

As to the sifting of lime, after being wetted, I have abandoned that long ago, unless where it is bad, and much of it unslaked, because I think that the less hadling it has the better. GEORGE ANDERSON.
—*London Journal of Gas-Lighting.*

Prizes in Industry and Agriculture.

The Societé d'Encouragement of Paris has recently published its list of prizes offered from 1876 to 1881 both inclusive. It may be mentioned that this Society bestows annually a a gold medal bearing the likeness of some man who has achieved a high reputation in art or science, or is the originator, whether French or foreign, of works which have exercised the greatest influence on French industry during the six preceding years; in 1873 this grand medal of the Society was awarded to our countryman, Sir Charles Wheatstone.

Although all the subjects are open to foreigners as well as natives of France, many would of necessity be confined to the latter. The following items from the long list are likely to have an interest in this country.

A prize of 200 francs is offered in 1880 to the author of the most important improvements in the material and processes employed in civil engineering, architecture, and public works.

A prize of 2,000 francs is ffered in 1879 to the inventor of a machine for combing short staple cotton, which has been brought into practical use.

A prize of the same amount is offered for 1880, for a machine for cutting files of all kinds automatically, and which shall have worked for at least three months.

A prize of the same amount is proposed to be awarded in 1877 for the invention of any efficient means of stopping the vibrations caused by steam hammers, and other tools acting by percussion, from being propagated beyond the works in which they are employed

Prizes of the same amount are offered in 1878 and 1879 for the industrial application of oxygenated water, and for the economic preparation and application of ozone; and in 1876 for fixing the nitrogen of the atmosphere in the form of nitric acid, ammonia, or cyanogene, the object being to obtain practically some compound of nitrogen cheap enough to use in making manure from the nitrogen of the atmosphere, to the exclusion of animal matter.

A prize of 6,000 francs is proposed for 1878 for a theory respecting steel, founded on actual experiments, and resulting in improved means of directing the manufacture of steel.

A prize of 3,000 francs, set down for 1880, for the disinfection of the residue from gas works.

One thousand francs are offered, in 1880, for an apparatus capable of producing high temperature in home workshops rapidly and economically.

The same sum is proposed, in 1879. for a new application of spectrum analysis to industrial purposes.

A prize of 2,000 francs is announced for a method of preventing soot adhering to chimneys so that they may be eompletely and easily cleaned.

All memoirs, models, etc., must be lodged with the secretary of the Society before the 1st of January of the year in which the prize is to be awarded. Full particulars will be found in the August number of the Bulletin of the Society, which is in the reading-room of the Society of Arts.—*Jour. Society of Arts.*

Water Supply from the New Red Sandstone.

A committee, with Prof. Hull, F.R.S., as chairman, has pursued investigations on the subject, with reference to the quantity and character of the water sup-

☞ *For other reading matter see page* 190.

THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY.

Publishing Office, No. 42 Pine Street.

PUBLISHED ON THE 2ND AND 16TH OF EACH MONTH

At No. 42 Pine Street, New York.

A. M. CALLENDER & CO.,

PROPRIETORS.

Editor—G. WARREN DRESSER.

THIS IS A RECOGNIZED OFFICIAL ORGAN OF—

LIGHT, HEAT, MINING INTERESTS, STEAM, WATER-SUPPLY, PATENTED INVENTIONS, VENTILATION, SANITARY IMPOVEMENT, AND GENERAL CHEMICAL SCIENCE.

TERMS

SUBSCRIPTION—Three Dollars per annum, in advance.

AGENTS:

NEW YORK—AMERICAN NEWS COMPANY, 119 and 121 Nassau St
BOSTON—S. M. PETTENGILL & Co., 6 State Street.
PHILADELPHIA—COE, WETHERILL & Co., Ledger Buildings, Phila.
Germany—B. WESTERMANN & Co., of New York.
Great Britain—TRUBNER & Co., 60 Paternoster Row, London.

☞ All communications to be addressed to **"The Proprietors,"** No. 42 Pine Street, Room 18, New York.

TUESDAY, NOVEMBER 16, 1875.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS*, or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 11 and 121 Nassau street, New York agents for this Journal. News dealers will please send orders to them.

NOTICE.

☞ *All Collections for Advertisements, Subscriptions, etc., are made directly from this Office. We have Agents to solicit the same, but they are not authorized to Receipt for Money.*

TO OUR SUBSCRIBERS AND PATRONS.

In making remittances for subscriptions, always procure a draft on New York, or a POST OFFICE MONEY ORDER, if possible. Where neither of these can be procured, send the money, but always in a REGISTERED LETTER. The registration fee has been reduced to eight cents, and the registration system has been found by the postal authorities to be actually an absolute protection against losses by mail. ALL Postmasters are obliged to register letters whenever requested to do so.

CONTENTS.

☞ An asterisk (*) denotes an illustrated article

Third Annual Meeting of the American Gas-Light Association.....181
CORRESPONDENCE—
Letter from Mr. Allen.....185
Lime Purification.....184
Street-Loss of Gas.....185
How Flames Become Luminous.....185
Gas-Light Intelligence.....176
Chemical and Scientific Repertory.....187
Preparation of Lime for Purification.....187
Prizes in Industry and Agriculture.....187
Water Supply from the New Red Sandstone.....187
EDITORIAL—
Light.....188
U S. Board Appointed to Test Iron, Steel, etc.....189
Literary Notices.....189
Sanitary Value of Iron Water Pipes.....190

LIGHT!

In our last we considered the subject of light as regards the laws of its propagation and intensity, and we will now continue the discussion and draw some conclusions. We showed that the "intensity of light was proportionate to the square of the displacement." The combustion being perfect, the displacement or amplitude of the waves which produce the sensation of light, or, in other words, the intensity of light will be proportional to the square of the volume of gas consumed. Representing the intensity of the light from a 1 foot burner by unity, we shall have by this law the following table of comparisons:

One	1	foot	burner	will give an intensity of	1
"	2	"	"	"	" 4
"	3	"	"	"	" 9
"	4	"	"	"	" 16
"	5	"	"	"	" 25
"	6	"	"	"	" 36
Two	2	"	"	"	" 8
"	3	"	"	"	" 18
"	4	"	"	"	" 32
"	5	"	"	"	" 50
"	6	"	"	"	" 72

From this, by comparison, we may deduce the following:

One	6	ft.	burner	is equal to	Four	3	ft.	burners.
"	6	"	"	"	" Nine	2	"	"
Two	6	"	"	are "	" Eight	3	"	"
Three	6	"	"	" "	" 12	3	"	"
Four	5	"	"	" "	" 11 1-9	3	"	"

This is, of course, on the supposition that combustion is perfect, and the difficulty of securing this will vary the results, especially with smaller volumes; but actual experiments have shown that with the larger burners, or those commonly used, the 4, 5 and 6 ft., the results are almost exact if reasonable care is taken to regulate the combustion.

From this we see, when the burners give anything like perfect combustion, that it is poor economy as regards intensity of light to use small burners, for we do not get anything like the quantity of light for the amount of gas burned. The only place where a small burner may be used with any advantage is where a small amount of light is wanted.

For a long time the rule was supposed to be that the intensity of light was proportional to the volume, and hence many of the experiments made to determine the illuminating or candle power of the gas of very rich coals, which could not be consumed in the standard burner, burning 5 feet per hour, with a chimney 7 inches long, without smoking, were in error and put the candle power too low. The principles laid down in our last number have been known for years, and in works upon light and sound we find repeatedly the rule—

"The intensity (of light or sound) is inversely as the square of the distance and directly as the square of displacement" (or amplitude.) But many of the investigations of scientific men on the subject of light, were conducted in reference to what might be called natural light or sunlight, and the application of the laws thereof to optical instruments. The undulatory theory is now admitted to be the true one, as by it many things may be accounted for that otherwise have no rational explanation. Perhaps no one has given the subject of illuminating power of gas more thorough study and investigation than Mr. William Farmer, and his announcement of these same principles in the Farmer's Theorem was only an application of these same universal laws of the subject of what is sometimes termed "artificial" light. We are aware that the correctness to this Theorem has been questioned, but the reason for its correctness was shown in our last; and it has also been shown by direct experiment that the results obtained by squaring are by far more correct than the old rule of proportion.

We will now consider the subject of interference of light—Tyndall has defined interference as follows, viz:

"The action of one system of waves upon another, whereby the oscillatory motion is either augmented or diminished, is called interference. In relation to optical phenomena it is called the interference of light."

Bearing in mind that the same general laws apply to light and sound (and, to a certain extent, to water) we must at the same time distinguish between the motion of the *wave* and the motion of the *individual particles* which constitute the wave. For, while the wave motion may be propagated through long distances, the motion of the particles is confined to a small orbit, In the the case of an object floating on water—while the wave rushes on the object is not carried with it, but appears to move up and down, so to speak. As the crest of the wave of water comes on, the object is lifted, as it passes, the object (floating) is depressed, showing that the tendency of one portion of the wave of water is to push up and of the other to pull down.

So it is in a wave of light, the motion carries the particle of ether up in half of its orbit, and down in the other half; and this distance which the particle moves up and down—as we have expressed it, is called the displacement or amplitude. This motion is not only up and down but the orbit is a conic section. One thing, however, must be borne in mind, *i. e.*, that the motion of a wave of light is in *every* direction from the source, so that the *wave front* is a *sphere*, and the illustration given above of an object on the water would only apply to one point in one part of the wave. Now, in the case of light proceeding from two different sources, it can easily be seen that the waves from one must have an effect upon those from the other.

Tyndall illustrates this by taking the case of two stones dropped into still water at the same time. Little waves will begin to radiate from each in circles; at some point the first, or outside ripple from one stone, will reach the first ripple from the other. Now, it will be seen that if the crests of these two happen to meet, the tendency of both is to "push up," or, if the furrows meet, the effort of both is to "push down," and the result will be that when crest coincides with crest, or furrow with furrow, the height of the crest and the depth of the furrow will be twice that of either alone.

If, on the other hand, the two ripples happen to come together in such a way that the crest of one strikes the furrow of the other, the tendency of one will be to elevate while that of the other will be to depress; and, supposing the two waves equal, the result will be that the two actions will counteract each other, and stillness will be the result. A *wave length* is the distance from crest to crest or furrow to furrow. Now what happened between the two first-mentioned ripples will occur with each succeeding pair (the wave lengths being the same), or with any two waves joining in such a way that crest coincides with crest, or furrow with furrow, or, in other words, in the case taken for illustration, the amplitude of the wave motion is increased when the retardation of one system behind the other, is equal to any number of *whole wave* lengths. When one wave is behind the other by a half wave length, or any odd number of wave lengths, then they neutralize each other.

This phenomena of motion added to motion, producing *no* motion, is called Interference; and when these phenomena relate to light, they are called the interference of light, and by the principle of interference are explained some of the most beautiful phenomena in Nature, but we have to do with its application to the subject of illumination. We have seen the advantage of concentrating the volume of gas burned. If we have two ordinary gas burners arranged upon swinging brackets in such a way that the two flames can be brought to touch each other, it is evident that with the two lighted at once, and burning separately, we consume a given quantity of gas and get a certain amount of light. Now, bring the two burners close together and unite the flames, we burn no more gas; but we shall at once see an increase of light and the light will be much whiter. Of course in this case there is the question of temperature coming in, but it all goes back to the same law—the heat is the result of motion, the motion is the result of the molecular displacement due to the combustion, etc.; but the luminous source approaches much nearer a *point*, and the interference arising from the two sources is done away with in a great degree. The wave propagating itself in a sphere, the more we can bring the form of a flame to that of a sphere the better. It is the principle of Interference which prevents the two separated sources of light from giving the same intensity as when the two are united in one. The Farmer theorem coincides with this, and the results may be stated as follows:

1st. The intensity of light is inversely as the square of the distance from the luminous source.

2d. The intensity of the light from ordinary gas (when combustion is perfect) is as the square of the volume of gas consumed.

3d. When two flames of equal intensity are united the two sources of light then become one, all the light waves will start from a common origin—the amplitude of the wave motion will be double that of either singly, and the intensity of the two combined will be four times that of either singly, combustion being perfect.

4th. When two perfect flames are placed at two separated points, a portion of the waves from each will interfere, and the illuminating power will thereby be diminished.

5th. The intensity of the light from ordinary oil lamps or candles, is as the square of the weight of the oil or sperm consumed (combustion being perfect).

6th. The intensity of the light from any point or spherical shaped luminary is as the square of the inflammable matter consumed, when combustion is perfect.

U. S. BOARD APPOINTED TO TEST IRON, STEEL, ETC.

Under Act of Congress, March 3d, 1875, the following board of officers and civil engineers has been appointed:

Lt. Col. T. T. S. Laidley, U. S. A., President.
Commander L. A. Beardslee, U. S. N.
Lt. Col. Q. A. Gilmore, U. S. A.
Chief Engineer David Smith, U. S. N.
W. Sooy Smith, C. E.
A. L. Holly, C. E.
R. H. Thurston, C. E., Secy.

This board is instituted to determine by actual tests the value of all kinds of iron and steel, and other metals which may be submitted to it, and to prepare tables which will exhibit the strength and value of said materials for constructive purposes. The board has organized by the appointment of the following standing committees:

(A) *On Abrasion and Wear.*—R. H. Thurston, C. E., Chairman.

To examine and report upon the abrasion and wear of railway wheels, axles, rails, and other materials under the conditions of actual use.

(B) *On Armor Plate.*—Lt. Col. Gilmore, U. S. A., Chairman.

(C) *On Chemical Research.*-A. L. Holley, C. E., Chairman.

To investigate the mutual relations of the chemical and mechanical properties of metals.

(D) *On Chains and Wire Ropes.*—Commander L. A. Beardslee, U. S. N., Chairman.

(E) *On Corrosion of Metals.*—W. Sooy Smith, C. E., Chairman.

To investigate the subject of the corrosion of metals under the conditions of actual use.

(F) *On the Effects of Temperature.*—R. H. Thurston, C. E., Chairman.

To investigate the effects of variations of temperature upon the strength and other qualities of iron, steel, and other metals.

(G) *On Girders and Columns.*—W. Sooy Smith, C. E., Chairman.

To arrange and conduct experiments to determine the laws of resistance of beams, columns, and girders, to change of form and to fracture.

(H) *On Iron, Malleable.*—Commander L. A. Beardslee, U. S. N., Chairman.

To report upon the mechanical and physical properties of wrought iron.

(I) *On Iron, Cast.*—Lt. Col. Q. A. Gilmore, U. S. A., Chairman.

To report upon the mechanical and physical properties of cast iron.

(J) *On Metallic Alloys.*—R. H. Thurston, C. E., Chairman.

To investigate laws of combination.

(K) *On Orthogonal Simultaneous Strains.*—W. Sooy Smith, C. E., Chairman.

The determination of the laws of simultaneous orthogonal strains.

(L) *On Physical Phenomena.*-W. Sooy Smith, C. E., Chairman.

To investigate the physical phenomena accompanying the distortion and rupture of materials.

(M) *On Reheating and Rerolling.*—Commander L. A. Beardslee, U. S. N., Chairman.

(N) *On Steels produced by Modern Processes.*—A. L. Holly, C. E., Chairman.

(O) *On Steel for Tools.*—Chief Engineer D. Smith, U. S. N., Chairman.

Some of the points to be investigated will be those coming under the daily experience of gas engineers, particularly those relating to the corrosion of metals—the effects of temperature—wrought iron and cast iron—and in case any statistics of value are known by any of our readers, it is earnestly requested that they will communicate with the committees as to where they may be found. It is a matter of general interst, and many of the points are of great interest to those engaged in the construction of gas works and apparatus.

LITERARY NOTICES.

VAN NOSTRAND'S ECCLECTIC ENGINEERING MAGAZINE.

The November number of this Monthly is at hand. The principal articles are Bridge and Tunnel Centres, by J. B. McMaster, C. E. Water Supply and Drainage, W. A. Corfield, M. A., Heat Absorbed by Expansion, Prof. S. W. Robinson; Telford & McAdam Roadway Pavements, A. P. Storrs Jr., C. E., and several selections from various engineering journals on different topics of interest to the gas engineer. All of these articles are worthy of careful perusal and study. Among the book notices given in this volume may be found many useful hints to direct the student in his search for information on many technical points.

SMITHSONIAN REPORT FOR 1874.

This volume (although a "Pub. Doc") is worthy of very different treatment from that accorded to many of the works from the government press. Its style is plain, clear, and attractive, and it contains several very valuable papers upon subjects of widespread interest, besides the usual detailed information about the working of the Institution during the year.

We would respectfully acknowledge the receipt, from W. H. McFadden, Chief Engineer Philadelphia Water Works, of the Report "On the Water Supply for the City of Philadelphia," made by the Commission of Engineers appointed by the Mayor.

A small pamphlet, by W. D. Marks, C. E., Chattanoga, Tenn., being a paper read before the Society of Engineers of St. Louis, is received, and we find it to contain much useful information to gas makers in a small compass. It is a "description of the ordinary process of manufacture of coal gas." Copies may be ordered from this office at 25 cents each.

TO GAS COMPANIES, AND CITY GOVERNMENTS.

DYOTT'S PATENT

CHAMPION STREET LAMP

Doubles the Light with the same quantity of Gas used in other Lanterns. *All others* waste half their light, illuminating the sky, or if the tops of metal, absorb it.

SINGLE TOP GLASS LAMPS BOTH GLOBULAR AND SQUARE become heated if a good light is put in them, and rain, hail or snow falling upon the HEATED GLASS BREAKS IT. When one glass is broken the wind will either blow the flame against the others and break them, or destroy the entire Lamp. *Nine-tenths of the breakage and cost of repairs of other* street lamps is owing to that cause.

DYOTT'S "CHAMPION" is the only DOUBLE TOP—the only Lamp that has the Opaline White Dome, which is a *never changing reflector;* it doubles the power of, and throws the light to a greater distance. It is also a perfect *protector*, shielding the heated top or the lamp from all inclemency of the weather. The white dome is kept cool by the passage of air between it and the transparent globe below. Rain, hail or snow will never break either the globe or dome. The globe rests upon rubber cushions, and is supported laterally by elastic springs, so that contraction or expansion of the globe, or jarring of the post will not break it. They can be cleaned in one-fourth the time required to clean other lanterns. The metallic portions are of iron, copper and brass, and are the most durable, economical, efficient and cheapest lamps in existence. For public buildings, and wherever an ornamental and powerful light is required, they are made in CLUSTERS of 2, 3, 4, 6, 7 and 10 lamps, which have no equal in this or any other country for *beauty, durability, efficiency* and economy, either in cost, use or ornamentation. Designs furnished when requested for specific purposes. Gas companies, or those who have the lighting of Cities in charge, are solicited to communicate with us in reference to the agency for its introduction.

The Franklin Institute has awarded our CHAMPION LAMP the highest premium: (they give a silver medal) and its Committee on Science and the Arts has recommended it as the best lamp in use. It has also invariably taken the highest premium at every Exhibition at which it has been presented, and elicits the strongest commendations wherever it is used. We have several new and handsome patterns of POSTS for Corporations, Parks, public and private use, also for clusters of lamps, that are not excelled in beauty or price at which they are furnished.

DYOTT MANUFACTURING CO.,
114 South 2nd Street, Phil'a, Pa.

374-6meot

J. H. GAUTIER & CO.,

CORNER OF

GREENE AND ESSEX STREETS,

JERSEY CITY, N. J.

MANUFACTURERS OF

Clay Gas Retorts,
Gas House Tiles,
Fire Bricks, Etc. Etc.
Ground Clay, Fire Brick and
Fire Sand in Barrels,

ALWAYS ON HAND.

J. H. GAUTIER.
C. E. GREGOR.

393-1y

plied to various towns and districts from these formations, and have largely circulated a form of inquiry to elicit the information required. Their report gave full details with reference to the Nottingham pebble, the Wall grange springs, Staffordsbire; the new red sandstone near Liverpool and Manchester, and wells in the south-west. The available area of water-bearing new red and Permian formations was much larger than the actual outcrop of those rocks as shown on the geological maps, there being extensive tracts of this and other similar formations which could be easily penetrated, and a supply of water obtained. As regards quality, the various analyses obtained placed the new red and Permian waters in an intermediate position between the hard waters of the mountain limestone and chalks and the soft water of the palæozoic rocks. It was the presence of sulphate of lime in the water used in brewing at Burton-on-Trent which was believed to give the Burton water its special pre-eminence in the manufacture of beer.

M. Molyneux believed the large amount of calcareous ingredients here met with (70 grains in an imperial gallon) to be due to the water dissolving the gypsum of the keuper marls, and the water, rising from the fault, was tapped by the artesian borings of the breweries. Next year the committee hope to report on the water-bearing properties of the whole of the English new red and Permian formations, the nature and chemical character of the waters obtained, and the effect of those waters on the sanitary condition of the people using them. They also hoped that, looking to the absolute freedom from organic impurity in water from wells properly constructed in those formations they might, by pointing out suitable sites for wells in areas at present without them, be the means in many districts of improving the health and lessening the death-rate of the population. The president said that unless scientific men and statesmen combined, this question, which was becoming the problem of the day, could not be solved. Prof. Hull added that scarcely any country possessed such water sources, but he thought compulsory legislation necessary.—*Iron.*

PRICES OF FOREIGN AND DOMESTIC GAS COALS.

[Reported Expressly for this Journal.]

NOVEMBER 16, 1875.

DELIVERED IN NEW YORK.

English Cannel.

Ince Hall	$17 00	@	18 00
Kirkless Hall	16 50	@	17 00

English Caking Coals.

Newcastle Gas	$5 75	@	00 00
Liverpool caking	11 50	@	12 00

British Province Coals.

Pictou			2 25
Block House—At Mines, $1.87, Gold			0 00
Caledonia—At Mines, $1.75, Gold			0 00
Little Glace Bay—At Mines, $1.75, Gold			2 00
Lingan—At Mines, $1.75, Gold			0 00
Sydney—Old Mine			3 00
" Reserve, $1.75, GoldMine			2 25
" International			— —

Duty, 15 cents per ton, gold. Freight to New York $2 25 (urrency. Cost of above coals delivered in New York, $5 25 @ $6 00, currency.)

Pennsylvania Coals.

Penn Gas Coal—At Amboy	$6 10	@	0 00
Westmoreland—At Amboy	6 10	@	0 00

(In New York both the above coals $6 50)

Shafton	6 50	@	0 00
Youghiogheny	6 50	@	0 00

West Virginia Coals.

MurphyRun	$6 50	@	0 00
Despard	6 50	@	0 00
West Fairmont	6 50	@	0 00
American Gas Coal	7 40	@	0 00
Fairmont	6 50	@	0 00
Newburgh Orrel	6 50	@	0 00
Pinnickinick	6 50	@	0 00
Cloverhill of Virginia	6 00	@	6 50
McKenzie Compound Mixture			— —

American Cannel Coals.

Peytona of West Virginia	$12 50	@	00 00
Darlington of Pennsylvania			— —
Cannelton Cannel			11 00
Red Bank—at Philadelphia			6 50
" —at South Amboy			7 25

Asphalts.

Albertite of New Brunswick	$— 00	@	— 00
Ritchie Mineral of West Virginia	18 00	at Balt'e.	
Trinidad Bitumen	— —	@	14 05

The Penn Gas Coal Company have contracted with the Gas-Light Co. for their entire supply for th en- m their Youghiogheny mines.

Gas Stocks.

Quotations by W. B. Scott & Co., Bankers,

24 PINE STREET, NEW YORK CITY.

NOVEMBER 16, 1875.

☞ All communications will receive particular attention

	Capital.	Par.	Bid.	Asked.
Gas. Co.'s of N. Y. City.				
Harlem	$1,850,000	50	137	140
Manhattan	4,000,000	50	310	312
Metropolitan	2,500,000	100	160	162
" Scrip		...	107	...
Mutual	5,000,000	100	107	108
New York	4,000,000	100	148	150
Westchester	466,000	50	100	105
Gas Co.'s of Brooklyn.				
Brooklyn	2,000,000	25	250	...
Citizens	1,200,000	20	153	156
" Scrip		...	101	...
Peoples	1,000,000	10	101	103
" Bonds		...	96	98
" Scrip		...	102½	...
Metropolitan	1,000,000	100	110	...
Nassau	1,000,000	25	134	...
Williamsburgh	1,000,000	50	147	...
" Scrip		...	102	...
Out of Town Gas Companies.				
Buffalo Mutual, N. Y	750,000	100	50	50
Baltimore, Md	2,000,000	100	190	...
Brockport, N. Y	25,000	...	...	85
Citizens, Newark	500,000	...	...	55
Derby of Conn	160,000	100	...	80
East Boston, Mass.		25	112	115
Hannibal, Mo	100,000	100	90	...
Hartford, Conn	700,000	25	41	43
Hempstead, L	40,000	100	...	100
Jersey City	386,000	...	160	...
Jamaica, L. I	25,000	100	...	100
Lewistown, Maine	400,000	100	...	75
Peoples, Jersey City		...	130	...
Peoples of Albany	1,000,000	100	...	60
Peoples of Baltimore		25	108	...
Rochester, N. Y		100	50	...
Fort Wayne, Ind		100	...	105
Woonsocket, R. I	150,000	100	100	...
Lima, Ohio	30,000	100	10	...
Jacksonville, Ill	120,000	...	80	00
Richmond Co., S. I.	300,000	...	100	105

The following shares were sold at auction on the 10th instant:

270 shares of the Manhattan, 310@311½.
100 " " New York, 151½.
$2000 Metropolitan Scrip at 107¼.
$4000 " 7 per ct. Bonds, interest June and December due in 1878, at 104½.

We note recent sales of the Fishkill Co., New York, at $7.50 per share—shares $50 each.

The Metropolitan Gas Co. of Brooklyn have declared their semi-annual dividend of 3½ per ct., payable on the 20th of this month,

Sanitary Value of Iron Water-Pipes.

It appears from the following that iron water-pipes have a distinct sanitary value. Prof. Medlock proved by analysis, a few years ago, that iron, by its action on nitrogenous organic matter, produces nitrous acid, which Muspratt called "Nature's Scavenger." The latter chemist found, as a generrl result, that by allowing water to be in contact with a large surface of iron, in about forty-eight hours every trace of organic matter was either destroyed or rendered insoluble, in which state it could be purified effectually by filtration.

Medlock found, on examining the water at Amsterdam, which smelt and tasted badly, that the sediment charred on iguition, and was almost consumed, showing that it consisted of organic matter. He also found that water, instead of taking iron from the service pipes, before entering them contained nearly half a grain of iron to the gallon; while in the water issuing from the pipes there was only an unweighable trace. Before entering the reservoir, the water holding iron in solution formed no deposits, while the water coming from the pipes, and freed from iron, gave organic sediment above mentioned. He then made analysis of water brought in contact with iron, and water not in contact, with the result that the water which had not touched iron contained 2.10 grains of organic matter, and 0.96 grain iron; the other gave only a slight trace of both, showing plainly that the organic matter in the water was either decomposed or thrown down by contact with iron, and this water when filtered, was found to be clear, of good taste, with no smell, and free from organic matter. It is not stated in what shape the iron was held in solution, but it was probably in that of carbonate, the usual iron salt in springs.—*Sanitary Record.*

Advertisers Index.

☞ In looking for advertisements, see figures 1 to 12, within brackets, at head of advertisement pages.

GAS BURNERS, APPARATUS, ETC.

American Meter Co.—West 22nd st., N. Y., Arch and 22d st., Phil., 548 Washington st., Boston....11
Cast Iron Gas and Water Pipe—S. Decatur Smith, York and Moyer streets, Phila., Pa....8
Cast Iron Gas and Water Pipes—R. D. Wood & Co., Philadelphia Pa....10
Cast Iron Gas and Water Pipe—Jno. McNeal & Sons, Burlington, N. J....8
Franklin Foundry and Pipe Works—Jas. Marshall & Co., 23 Nineteenth street, Pittsburgh, Pa....2
Gas Valves (Chapman) 75 and 77 Kilby st., Boston, Mass....3
Gas-Burners—C. Gefrorer, 248 North 9th st., Phila., Pa....9
Gas Purification—St. John and Cartwright....5
Gas Meters, etc.—Harris, Griffin & Co., 12th and Brown streets, Phila., Pa....10
Gas Meters, etc.—Wm. W. Goodwin & Company, 1012 Filbert street, Phila, Pa....17
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry st., Philadelphia, Pa....11
Gas Fixtures, Etc.—Mitchell, Vance & Co., 597 Broadway....7
Gasholders, Etc.—Delly & Fowler, 39 Laurel st., Phila., Pa....4
Gas Screen—James P. Mahon, Boston, Mass....5
Gas Engineer—Henry Cartwright, Phil. Pa....4
Lime Hurdles.—Manhattan Lime Hurdle Co., Geo. W. Day, Treas., No. 3 Railroad Square, Haverhill, Mass....2
Lava Tips and Scotch Tips—Charles H. Meyer & Co., 227 Chestnut street, Phil. Pa....8
National Tube Works Co., 78 William St., N. Y....7
Patent Conically Slotted Wood Trays—John L. Cheesman, 147 and 149 Avenue C., N. Y....4
Patent Gas Exhauster—Smith & Sayre, 95 Liberty street....4
Pelouze & Audouin Condenser—Jas. R. Smedberg, Sole Agent for U. S. San Francisco, Cal.; Henry Cartwright, 2107 Green street, Phil. Pa....1
Petroleum Gas—J. D. Patton, Treverton, Pa....4
Patent Gas Exhauster—S. S. Townsend, Agt., 31 Liberty street, N. Y....3

GAS COALS

Cannelton Coal Co. of West Virginia—J. Tatnall Lea, 325 Chestnut street, Phila, Pa....3
Despard Coal Co.—Parmelee & Bros., Agents, 32 Pine st., New York....7
Gas Coals—Bird, Perkins & Job, 27 South st., N. Y....7
Monongahela Gas Coal—56 Exchange Place, Baltimore, Md. 6
New York and Cleveland Gas Coal Company—384 Fifth Avenue, Pittsburgh, Pa....6
Ohio Gas Cannel—G. Merryweather, Pine cor. Wm. sts.
Penn Gas Coal Co.—11 Merchants' Exchange, Phil. and 90 Wall street, N. Y....6
Peytona Cannel Coal—S. E. Low, 58 Broadway, N. Y....5
The Newburg Orrel Coal Co.—Chas. W. Hays, Agent in New York, Trinity Building, 111 B'way, Room 7....6
Tyrconnell Gas Coal—52 S. Gay Street, Baltimore, Md....6
Westmoreland Coal Co.—230 South 3rd Street, Phil. Pa....
Youghiogheny Coal—Perkins & Job, 27 South St. N. Y....7

FOUNDRIES.

Atlantic Dock Iron Works—John P. Kennedy, Office 98 Liberty street, N. Y., P. O. Box 2348....
Cast-Iron Pipes and Fittings—B. S. Benson, 52 East Monument street, Baltimore, Md....
Continental Works—T. F. Rowland, Greenpoint....6
Camden Iron Works, Camden, N. J.—Jesse W. Starr & Son.
Gloucester Iron Works—J. P. Michellon, Sec., 6 North 7th street, Phila., Pa....4
Mill Street Foundry.—Geo. Stacey & Co., Cincinnati O....5
National Foundry and Pipe Works—Wm. Smith, Carroll, Pike, Smallman & Wilkins streets, Pittsburg, Pa....
Oregon Iron Foundry—Herring & Floyd, 740 Greenwich street, N. Y....10
Pascal Iron Works—Morris, Taskar & Co., Philaelphia....12
Providence Steam and Gas Pipe Co., Providence, R. I.—H. A. Branch, Agent....3

WATER METERS, PUMPS, ETC.

Cast Iron Pipes for Water and Gas—Riley A. Brick, 112 Leonard street, N. Y....10
Valves for Water, Steam and Gas—Ludlow Valve Man'g Co., 940River street, Troy, N. Y....6
Water Pipes, etc.—S. Fulton & Co., 412 Walnut st., Phila....7

CLAY RETORT WORKS.

B. Kreischer & Son, Clay Retorts, etc., 58 Goerck st., N. Y. 8
Cheltenham Fire Brick and Clay Retort Works—Evens & Howard, 916 Market street, St. Louis, Mo....
Manhattan Clay Retort Works, 15th st., near Av. C, N. Y.. 8
Philadelphia Fire Brick Works, Vine and 23d sts., Phila....8

LAMPS, STOVES, PETROLEUM, ETC.

Lamps—M. B. Dyott, 114 South 2nd Street, Phil. Pa....1
Patent Lamp Post—J. W. Graham, Chillicothe, Ohio, or A. M. Callender, office of this Journal....9

MISCELLANEOUS.

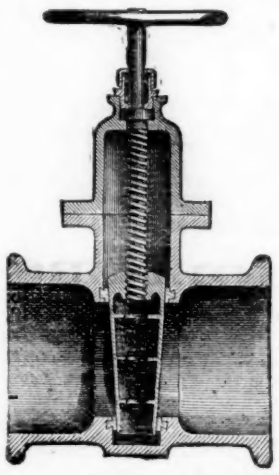
Analysis and Testing of Gas Coals—Prof. Henry Wurtz, 12 Hudson Torrace, Hoboken, N. J....10
Architect and General Gas Engineer—William Farmer, 111 Broadway Room 95, N. Y....
Brass Cocks, Plumbers' Materials, etc., etc.—McNab & Harlin Manufacturing Co., 56 John st., N. Y....7
Cements—S. L. Merchant & Company, 76 South st., N. Y....
Contractors for Gas Works, Etc.—Murray & Baker, Fort Wayne, Ind....2
Fodell's System of Bookeeping—A. M. Callender & Co., 42 Pine st., New York....1
Gas Engineer—B. E. Chollar, 914 Olive St., St. Louis, Mo...
Gas-Light Company of America, 63 and 64 Drexel Building, New York....2
Kidd's Gas Consumers Guide—A. M. Callender & Co., 42 Pine Street, N. Y....
Massachusetts Institute of Technology—Samuel Kneeland Boston, Mass....
National Coal Gas Company—H. P. Allen, 4 Warren street New York....6
School of Mines, Columbia College, East 49th st....9
Screening Shovels—Herring & Floyd, 740 Greenwich st., New York....7
Scientific and Practical Chemist and Geologist—Profetsor Henry Wurtz, 12 Hudson Terrace, N. J....
Screening Shovels—G. W. Dean, 1358 Broadway, N. Y.....
Springfield Gas Machine—Corner Canal and Centre St.....
Slade's Automatic Fire Governor—Jas. Slade, Gas Works, Yonkers, N. Y....

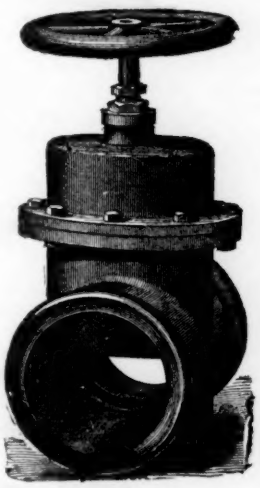
CHAPMAN VALVE MANUFACTURING CO.

MANUFACTURERS OF

CHAPMAN GAS VALVES.

Office and Sales Room 75 and 77 Kilby Street, Boston.





These Valves have been in use for several years, and are pronounced by all who have used them to be

The Best Gas Valves Ever Made.

They afford a direct passage the full size of the pipe. The seats are made of an alloy similar to BABBITT metal, specially prepared for the purpose, and superior to all other metals used for the seats of Gas Valves. It does not corrode under any circumstances to which it is exposed.

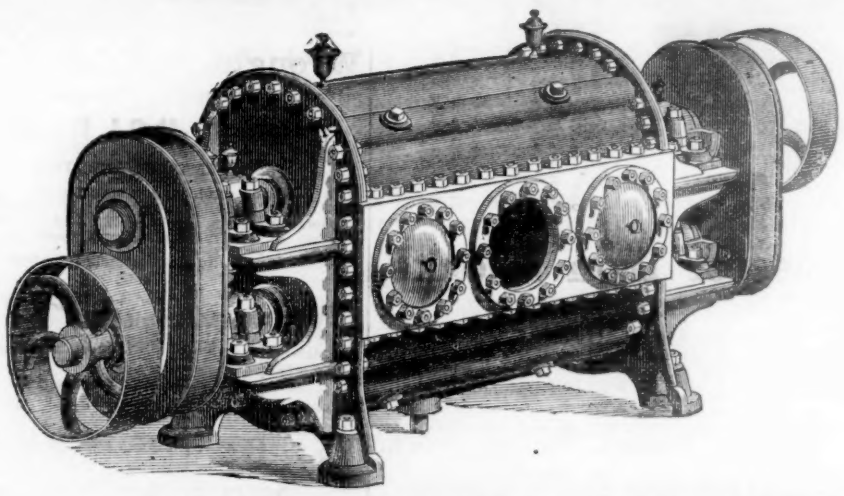
There is no LIABILITY OF COHESION between the Gate and Seat, and the Valves can be relied upon to SHUT TIGHT and OPEN EASILY at all times—an important desideratum when used for street mains, in cases of fire.

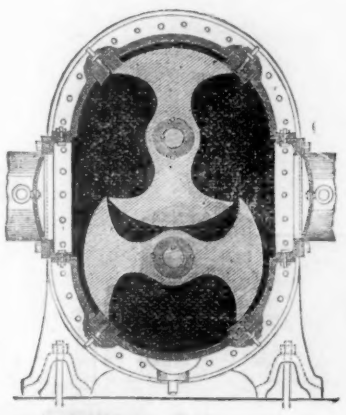
We refer to the following named Gas-Light Companies among the many that have used these Valves:

BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CAMBRIDGE GAS-LIGHT COMPANY, CAMBRIDGE, MASS.
NEWTON & WATERTOWN GAS-LIGHT CO., WATERTOWN, MASS.
LAWRENCE GAS-LIGHT COMPANY, LAWRENCE, MASS.
PEOPLES GAS-LIGHT COMPANY, BROOKLYN, N. Y.
CITIZENS GAS-LIGHT COMPANY, BROOKLYN, N. Y.
SOUTH BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CHARLESTOWN GAS-LIGHT CO., CHARLESTOWN, MASS.
LYNN GAS-LIGHT COMPANY, LYNN, MASS.
FITCHBURG GAS-LIGHT COMPANY, FITCHBURG, MASS.
CITIZENS GAS-LIGHT COMPANY, NEWARK, N. J.
WILLIAMSBURGH GAS-LIGHT CO., WIRLIAMSBURGH, N. Y.

GAS AND WATER VALVES ½ INCH TO 36 INCHES DIAMETER.
STEAM VALVES ½ INCH TO 12 INCHES DIAMETER.
357-tf

PATENT IMPROVED GAS EXHAUSTER.





P. H. & F. M. ROOTS, PATENTEES AND MANUFACTURERS, CONNERSVILLE, IND.
S. S. TOWNSEND, GENERAL AGENT, 31 LIBERTY STREET, NEW YORK.

The following are some of the advantages we claim for this Exhauster over all others:

FIRST.—It is simpler in its mechanical construction than any other Exhauster in use.

SECOND.—The internal parts consist of only two revolvers, each cast entire in one piece, without a single screw, bolt, nut, washer, key or other part to get loose on the inside and stop or break the machine. The internal operating parts, therefore, can not get out order and hence require no care or attention.

THIRD.—Every part of the machine requiring care or attention, as the journals, gearing, etc., is external, easily observed and attended to. All changes, adjustments, and repairs are made from the outside. The journal bearings, if necessary, can be renewed in a few minutes.

FOURTH.—The internal operating parts are practically gas-tight, but are not in actual contact, hence there is no internal friction or wear. The machine is therefore operated with less power than any other.

FIFTH.—They are built in the most complete and substantial manner, with steel shafts and improved journal bearings, and their durability is almost without limit.

We build them of any required capacity, large or small, adapted to any kind of works or place.

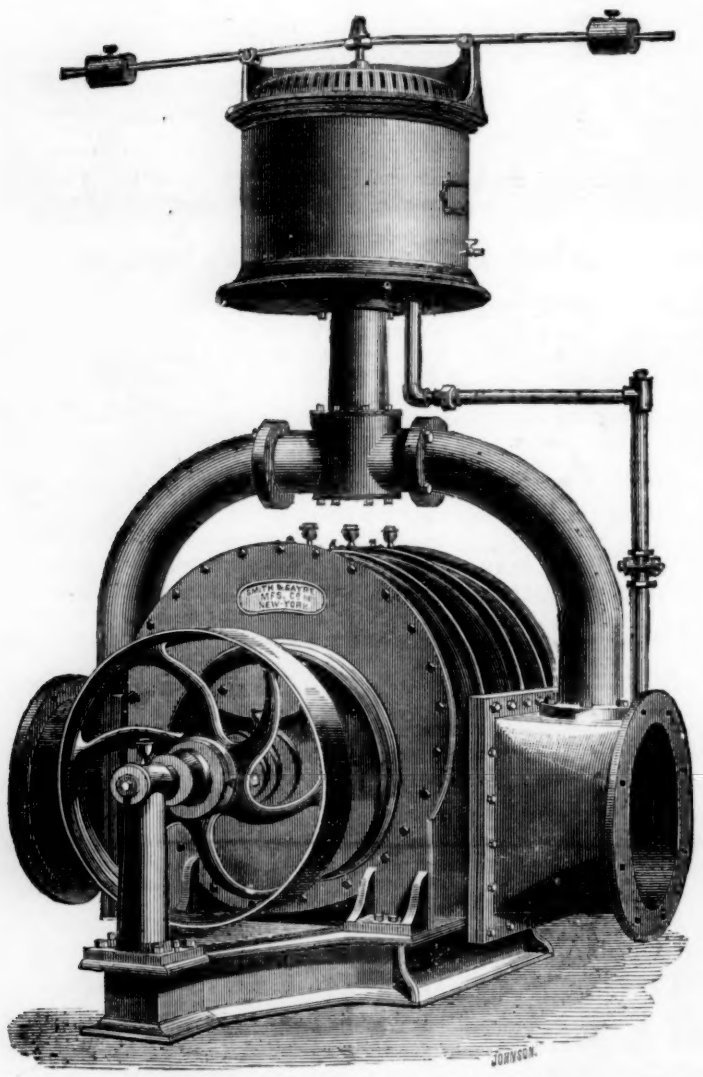
Send for Illustrated Catalogue, giving all particulars as to capacity, speed, power required, dimensions, and price of each size and references to parties using them.

P. H. & F. M. ROOTS.

SMITH & SAYRE MANUFACTURING COMPANY.

The Mackenzie Patent Gas Exhauster

And Patent Compensator.



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-jo ints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

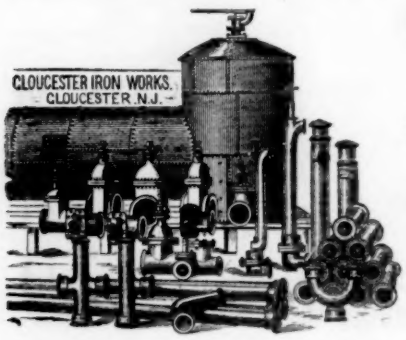
MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary fan The Cupolas are manufactured in sizes to melt from 1 to 20 tons per hour, will save one quarter of the time required by the old style Cupola and 33 per cent fuel. Address

G. G. PORTER, President.

CHARLES W. ISBELL, Secretary. JAMES M. SAYRE, Treasurer.

OFFICE, 96 LIBERTY STREET, New York.



Gloucester Iron Works,

OFFICE—NO. 5 NORTH SEVENTH STREET,

PHILADELPHIA.

DAVID S. BROWN, Pres't. JAMES P. MICHELLON. Sec'y.
BENJAMIN CHEW, Treas. WILLIAM SEXTON, Sup't.

CAST IRON GAS AND WATER PIPE.

Cast Iron Heating and Steam Pipe. Stop Valves. water or Gas.

Fire Hydrants,

GAS HOLDERS.

EVENS & HOWARD,

Manufacturers of a superior quality of

Fire-Brick, Clay Gas Retorts,

Gas Tile, Drain Pipe, Fine Ground Fire Clay, &c.

916 Market Street, St. Louis, Mo.

TYRCONNELL GAS COAL.,

MINED IN TAYLOR COUNTY, WEST VA.

Company's Office, 52 S. Gay St., Baltimore.

CHARLES MACKALL, Secretary.

CHARLES W. HAYS, Agent, Room 7, 111 B'way, N. Y.

SHIPPING POINT—Baltimore, Md.

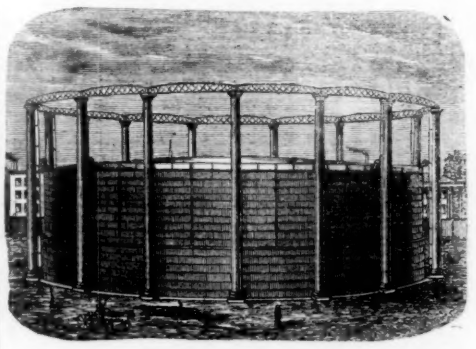
This coal yields 10,000 cubic feet of Gas, with an illuminating power of over 16 candles. Forty bushels very superio Coke, with little Ash, and scarcely any clinker. 0i-1y

T. F. ROWLAND,

Continental Works,

GREENPOINT, BROOKLYN, N. Y.

ENGINEER, AND MANUFACTURERS OF



GAS-HOLDERS

OF ANY MAGNITUDE,

Condensers, Scrubbers, Purifiers, Retorts, Hydraulic Mains and all other articles connected with the Manufacture and Distribution of Gas, furnished with despatch. Plans and Specifications prepared, and Proposals given for the necessary Plans for Lighting Cities, Towns, Mansions, and Manufactories.

JESSE W STARR & SON,

Camden Iron Works

Camden, New Jersey,

Office in Philadelphia No. 435 Chestnut St., where a member of the Firm can be seen between 12 m. and 2 p. m. daily.

MANUFACTURERS OF

ALL KINDS OF CASTINGS AND APPARATUS FOR GAS WORKS,

Wrought Iron Roof Frames,

For Retort and other houses Retorts and all castings required for setting them in the latest and most improved model. WASHERS, CONDENSERS, SCRUBBERS and EXHAUSTERS for relieving the Retorts from pressure. PURIFIERS, varying from 2,000 to 2,000,000 cubic feet daily purifying capacity.

Wrought Iron Lime Sieves

for Purifiers. Station Meters of all sizes.

GAS HOLDERS,

TELESCOPIC AND SINGLE,

With cast iron guide and suspension frames. GAS GOVERNORS or REGULATORS, STREET MAINS, from 1½ to 48 INCHES DIAMETER, for WATER or GAS. Street Main connections, such as BRANCHES, BENDS, DRIPS, SLEEVES, etc.

STOP VALVES, from 3 to 30 inches, for both Water and Gas.

Wrought Iron Work.

All the Smith and Sheet Iron work required in and about Gas Works. 226-tf

JESSE W. STARR. JESSE W. STARR, JR.

P.P. DEILY. J. FOWLER.

1842. *1875.*

DEILY & FOWLER,

39 LAUREL STREET, PHILADELPHIA, PA.,

Builders of Gas Works.

MANUFACTURERS OF

GAS-HOLDERS,

Single and Telescopic.

WROUGHT IRON ROOF FRAMES,

COAL WAGONS,

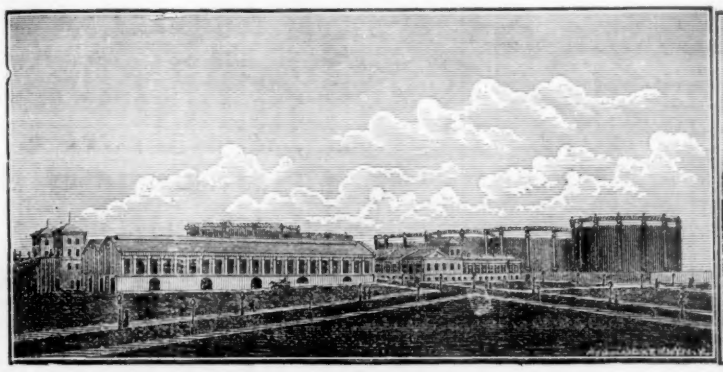
COKE BARROWS,

AND ALL

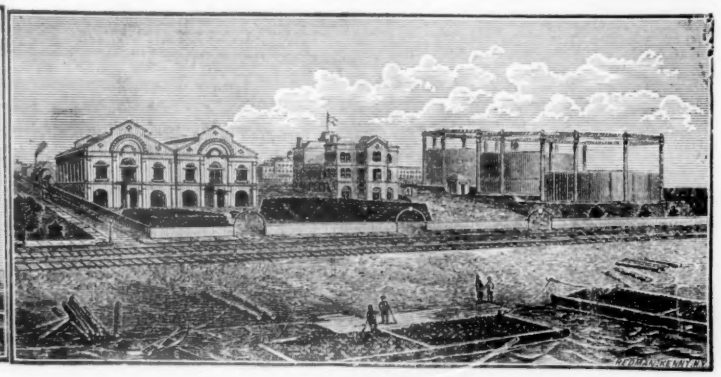
Wrought Iron Work

CONNECTED WITH GAS WORKS.

☞ Particula attention paid to Extensions and Repairs.



CINCINNATI GAS WORKS, ERECTED 1871-72-73.—WM FARMER, ENG.



LACLEDE GAS WORKS, ERECTED 1872.—WM. FARMER, ENG

WILLIAM FARMER,

ARCHITECT AND GENERAL GAS ENGINEER,

111 BROADWAY, TRINITY BUILDING, Room 95, New York.

WILLIAM FARMER may be consulted upon all matters connected with the construction of GAS WORKS, or any other description of buildings. Will furnish General and Detail Drawings, Specifications and Estimates for Gas Works of any capacity.

PATENTEE OF THE FOLLOWING INVENTIONS:

Exhausters for Gas and Foul Lime Ventilation,
Dumping Barrows for Coal, Coke and Lime,
Hydraulic Mains for Retort Benches,
Blowers for Forges, Foundries, &c.
Pumps for Water, &c., &c.

REFERENCES:

Professor SILLIMAN, New Haven, Conn.
GEN. CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
A. W. BENSON, President Brooklyn Gas-Light Company. Brooklyn, N. Y.
W. W. SCARBOROUGH, President Cincinnati Gas-Light Company, Cincinnati, Ohio.
S. L. HUSTED, President Laclede Gas-Light Company, St. Louis, Mo.
Prof. HENRY WURTZ, 12 Hudson Terrace, Hoboken, New Jersey.
GEN. A. HICKENLOOPER, Vice-President Cincinnati Gas-Light Co., Cincinnati, Ohio
FREDERICK CROMWELL, Vice-President Laclede Gas-Light Company. St. Louis Mo.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
JAMES R. SMEDBERG, Consulting Engineer, San Francisco Gas-Light Co., Cal.

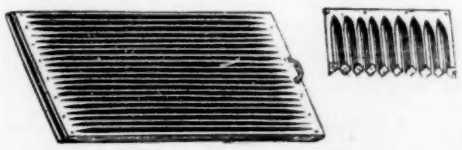
To Gas Companies.

CHEESMAN'S

CONICALLY AND DIAMOND SLOTTED

SOLID WOOD TRAYS.

PATENTED OCTOBER 21, 1862 AND JUNE 10, 1873.



The above Trays are made from half inch to one and a quarter inch thick with a strong centre piece, bars bevelled on top. Also the Diamond Bar Tray can be used either side up; smoothest and most durable Trays in use. They are now used by more than three hundred Gas Companie in the United States and other places.

JOHN L. CHEESMAN,
151 and 153 Avenue C, New York.

GEO. W. DRESSER,

CIVIL ENGINEER.

TRINITY BUILDING,

ROOM 93. 111 BROADWAY.

DUFFEE'S IMPROVED

GAS SCREEN,

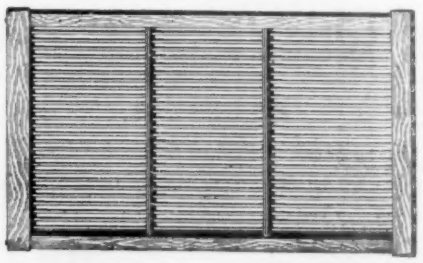
OFFICE 19 TREMONT ROW, ROOM 5,

BOSTON, MASS.

JAMES P. MAHAN, Treasurer.

Manufactory at Haverhill, Mass.

E. DUFFEE, Agent,
Formerly with AMERICAN GAS SCREEN CO.,
Haverhill, Mass.



The Screen is made with an ash or oak frame, perforated with ROUND RATTANS, turned and reeved through, drawing the frame firmly together, strengthening it *without the use of nails or rivets.*

This Screen is reversible, can be used either side up, gives a large purifying apacity; there is no clogging by foul lime, as the rattan presents a smooth surface and c be cleaned very easily. It is considered by all Gas Engineers who have used it to be the best Screen now in use.

☞ **Samples sent Free to all Parts of the United States.**

All communications should be addressed to

JAMES P. MAHAN,
19 Tremont Row, Room 5.
Boston, Mass.

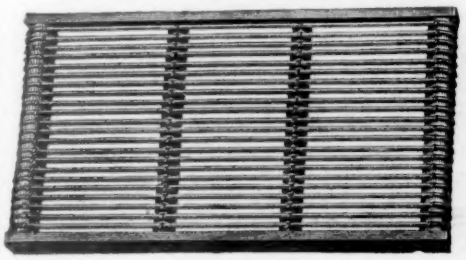
384-6t

THE MANHATTAN

LIME HURDLES

after a practical trial have been adopted by over thirty Gas-Light Companies *the last season*, some of them the largest in the country.

They are LIGHT, STRONG and DURABLE, made *with Ash frame* and *round flexible Rattans.*



Shipped to all parts of the country.
Address

THE MANHATTAN

LIME HURDLE CO.

HAVERHILL, MASS.

J. L. BLAISDELL, President.
GEORGE W. DAY, Treasurer. 389

GAS FITTERS, PULMBERS, STEAM FITTHRS, ENGINEERS, MACHINISTS, Apprentices, and Gas Consumers, should all read the

GAS FITTERS and PLUMBERS GUIDE.

Price 50 and 75 cents. Sold only by the author and publisher.
S. D. GALLOWAY,
th Street, Philadelph

GAS COALS.

THE

PENN GAS COAL COMPANY

OFFER THEIR

COAL, CAREFULLY SCREENED,

AND PREPARED FOR

GAS PURPOSES.

Their Property is located in the Youghiogheny Coal Basin, near Irwin's and Penn Station, on the Pennsylvania Railroad, and on the Youghiogheny River.

OFFICES

No. 11 Merchants Exchange, Phil'a. 90 Wall Street, New York.

PLACES OF SHIPMENT.

Pennsylvania Railroad, Pier No. 2 (Lower Side).
Greenwich Wharves, Delaware River.
366-1y **Pier No. 1 (Lower Side), South Amboy, N. J.**

CANNELTON COAL CO.

OF WEST VIRGINIA.

Offer for sale the following Coals, from their Colliery at CANNELTON, Kanawha County, West Virginia, delivered at RICHMOND, Va.:

CANNELTON CANNEL,

cknowledged to be the most valuable ENRICHER produced in this country, a gross ton yielding 10,000 ubic feet of GAS of 64·54 CANDLE POWER; COKE 32 bushels, of good quality.

CANNELTON CAKING COAL.

Volatile Matter.	Coke.	Per cent. of Ash in		Sulphur in			Specif. Gravity.	
		Coal.	Coke.	Coke.	Ootl.	Volatile Matter.	Coal.	Gas.
35.1	64.9	2	6	.82	1.48	.66	1.289	.476

MAXIMUM YIELD, 5.06 cubic feet of Gas per pound of Coal—A yield of 4·78 cubic feet per lb.. —gave 16 14-100 Candle-Power.

COKE, of very fine quality—1453 pounds produced from one ton of coal.

SALES AGENTS - J. TATNALL LEA, Treasurer, P. O. Box 1747 Philadelphia.
PERKINS & JOB, 27 South Street, N. Y.; 91 State Street, Boston.
H. W. BENEDICT & SON, New Haven.

JAMES McKELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

ESTABLISHED 1840.

AGENT FOR

THE BOGHEAD

CANNEL COAL.

THE DUKE OF HAMILTON'S

Lesmahaga Cannel Coal

THE WOODBANK AND PIRNIE

CANNEL COALS.

THE DUKE OF HAMILTON'S

Home Farm and Bo[illegible] CANNEL COALS.

THE AUCHLOCHAN & QUARTER

CANNEL COALS.

Analyses and Prices of all the principal SCOTCH CANNEL COALS will be forwarded on application. 329-1y

THE NEWBURGH

Orrel Coal Company,

Mines at Newburg, Preston County, W. Va.

Company's Office, No. 52 S. Gay Street, Baltimore, Md.

C. OLIVER O'DONNELL, Pres't. CHAS. MACKALL, Sec'y.

CHAS. W. HAYS, Agent in New York, Room 7, Trinity Building, 111 Broadway.

SINCLAIR & AGNEW, Agents, Alexandria, Va.

This Company offer their very superior Gas Coal at lowest market prices.

It yields 10,996 cubic feet of gas to the ton of 2,240 lbs. of good illuminating power, and of remarkable purity; one bushel of lime purifying 6,792 cubic feet, with a large amount of coke of good quality.

It has been for many years very extensively used by various Gas Companies in the United States, and we beg to refer to the Manhattan, Metropolitan, and New York Gas Light Companies of New York; the Brooklyn and Citizen's Gas Light Companies of Brooklyn, N. Y.; the Baltimore Gas Light Company of Baltimore, Md., and the Providence Gas Light Company, Providence, R. I.

The best dry coals shipped, and the promptest attention given to orders. 234-1y

THE DESPARD COAL COMPANY

OFFER THEIR SUPERIOR

DESPARD COAL

To Gas Light Companies throughout the country.

Agents, PARMELEE BROTHERS, No. 32 Pine street, N. Y.
BANGS & HORTON, No. 31 Duane street, Boston.
Mines in Harrison County, West Virginia.
Wharves Locust Point, } Baltimore.
Company's Office, 29 South street, }

Among the consumers of Despard Coal, we name: Manhattan Gas Light Company, New York; Metropolitan Gas Light Company, New York; Jersey City Gas Light Company, N. J.; Washington Gas Light Company; Portland Gas Light Company, Maine.

*** Reference to them is requested 204-1y

NEW YORK AND CLEVELAND

GAS COAL COM'Y

Of Pittsburgh, Pa.

MINERS AND SHIPPERS OF

YOUGHIOGHENY GAS COAL.

This Company is prepared to furnish any amount of their justly celebrated, and acknowledged superior GAS COAL, to any point reached by railroad or navigation, on most favorable terms.

General Office—384 Penn Avenue,
PITTSBURGH, PA.

Branch Office—C. & P. RR. Coal Pier,
CLEVELAND, OHIO.

WILLIAM A. McINTOSH, President.
A. CARNEGIE, Vice-President.
W. P. DE ARMIT, Treasurer.
THOMAS AXWORTHY, Agent at Cleveland, Ohio.
W. H. WATERBURY & CO., General Sales Agents,
351-1y 137 Broadway, New York.

PEYTONA

CANNEL COAL

From West Virginia.

Yields over 13,000 feet of Gas per ton. At ten thousand feet (standard yield) the illuminating power is over 43 candles. Purifies 4,510 feet to the bushel of lime.

S. E. LOW, Secretary,
Office, 58 Broadway.

OFFICE OF THE

NATIONAL COAL GAS COMPANY,

No. 4 Warren Street, New York.

H. P. ALLEN, President.
I. B. BRICE, Vice-President.
A. H. ALLEN, Secretary.
WM. J. VALENTINE, Treasurer.
GEORGE W. HARRIS, Engineer.

This Company is the owner of the GWYNNE-HARRIS, o AMERICAN HYDROCARBON process, for making Gas for Lighting or Heating purposes, by the perfect decomposition of superheated steam, under what is known as the

GWYNNE AND HARRIS PATENTS.

This process has been fully tested nearly 50,000,000 cubic feet of Gas having been made under it, and fully demonstrating the fact that it is the greatest improvement ever made in the manufacture of Gas, either for Lighting or Heating purposes. With half a ton of Anthracite Coal 150,000 cubic feet of Gas per day is made from three benches, and the labor is so small that one man can attend three or four benches.

The process can be put into either Coal or Oil Gas Works (or where both Coal and Oil are used) at small cost, without any interruption to the working of other benches. The Citizens Gas-Light Company of Brooklyn, after using it for more than seven months, have found it not only far better, but actually *cheaper* than atmospheric air in making Gas, with the use of "petroleum and its products."

Further information, and terms of sale of rights will be ven, upon application to the Company 348-1y

Portland Cement,
Roman Cement,
Keene's White Cement,

NUMBERS 1 AND 2.

From best London Manufacturers.

FOR SALE BY

S. L. MERCHANT & CO.,

76 South Street, New York,
Corner Maiden Lane. 344-1y

B. E. CHOLLAR,

GAS ENGINEER,

914 OLIVE STREET, ST. LOUIS, MO.

355-

WROUGHT IRON

ENAMELED GAS AND WATER PIPE,

MANUFACTURED SOLELY BY THE

NATIONAL TUBE WORKS COMPANY.

ALSO MANUFACTURERS OF

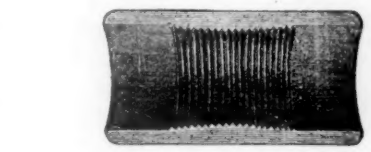
Lap-welded Steam and Gas Pipe,
Tubing and Casing for Artesian, Oil and Salt Wells (WITH PATENT PROTECTING COUPLING),
Lap-welded Iron Boiler Tubes,
Mack's Patent Injector, Etc.

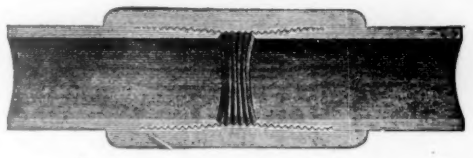
WORKS AT BOSTON, MASS., AND McKEESPORT, PENN.

OFFICES AND WAREHOUSES.

New York, No. 78 William Street.
Buffalo, No. 216 Main Stree
Chicago, Nos. 112, 114 & 116 Lake Street,
Cincinnati, Nos. 119, 121 & 123 Pearl St.

Patent Sleeve or Protecting Couplings





THE WAVERLY COAL AND COKE CO.

Offer for Sale the

YOUGHIOGHENY COAL

DOUBLE SCREENED,

from their Colliery at Smith's Mills, on the Youghiogheny River, thirty-seven and a half miles southerly of Pittsburgh. This Coal has the preference in Pittsburgh over all other YOUGHIOGHENY COAL for GAS PURPOSES.

The facilities of the WAVERLY COMPANY are unsurpassed by those of any other Company on the Youghiogheny.

Full particulars can be had by addressing

PERKINS & JOB, Agents,
27 South Street, New York.
91 State Street, Boston.

THE WESTMORELAND COAL CO.

CHARTERED 1854.

MINES situated on the **Pennsylvania** and the **Connellsville Railroads** in **Westmoreland County, Pa.**

POINTS OF SHIPMENTS:

PENNSYLVANIA RAILROAD, Pier No. 2 (upper side), Greenwich, Delaware River,
Pier No. 1 (upper side), South Amboy, New Jersey.
Since the commencement of operations by this Company its well known

BITUMINOUS COAL

has been largely used by the **GAS COMPANIES, RAILROADS,** and **IRON and STEEL WORKS** in the **New England** and **Middle States,** and its character is established as having no superior for freedom from sulphur and other impurities.

Principal Office, No. 230 South Third Street, Philadelphia.

EDWARD C. BIDDLE, President.
EDMUND H. McCULLOUGH, Sec. FRANCIS H. JACKSON, Vice Pres't

FOR SALE,

200 Tons
CANNEL CHIPS.

Address H. E. HOY,
34 New Street, N. Y.

Gas Engineers,

AND PARTIES ENGAGED IN THE BUILDING OF

GAS WORKS,

who desire information regarding PETROLEUM GAS, either or use pure, or for enriching, are requested to address, sta ng particulars.

J. D. PATTON,
963-unl Treverton, Northumberland Co. Pa.

McNAB & HARLIN MAN'FG CO.

MANUFACTURERS OF

BRASS COCKS

FOR STEAM, WATER AND GAS.

Plumbers Materials.

WROUGHT IRON PIPE

Gas and Steam Fitters' TOOLS.

56 JOHN STREET, N. Y.

☞ Illustrated Catalogue and Price sent on application,
378-3m

SPRINGFIELD GAS MACHINE
238 CANAL ST.
NEW YORK

Illustrated Circular of over 100 pages sent Free. 369-1t

MITCHELL, VANCE & CO.,

Manufacturers of

CHANDELIERS !

And Every Description of
GAS FIXTURES,
Also Manufacturers of
Fine Gilt Bronze and Marble Clocks, warranted best Timekeepers, Mantle Ornaments, &c.

Salesroom, 597 BROADWAY,
Rear Entrance 140 Mercer Street,)
NEW YORK.

Special designs furnished for Gas Fixtures for Churches ublic Halls Lodges &c.

RILEY A. BRICK & CO.,

MANUFACTURERS OF

CAST IRON PIPES,

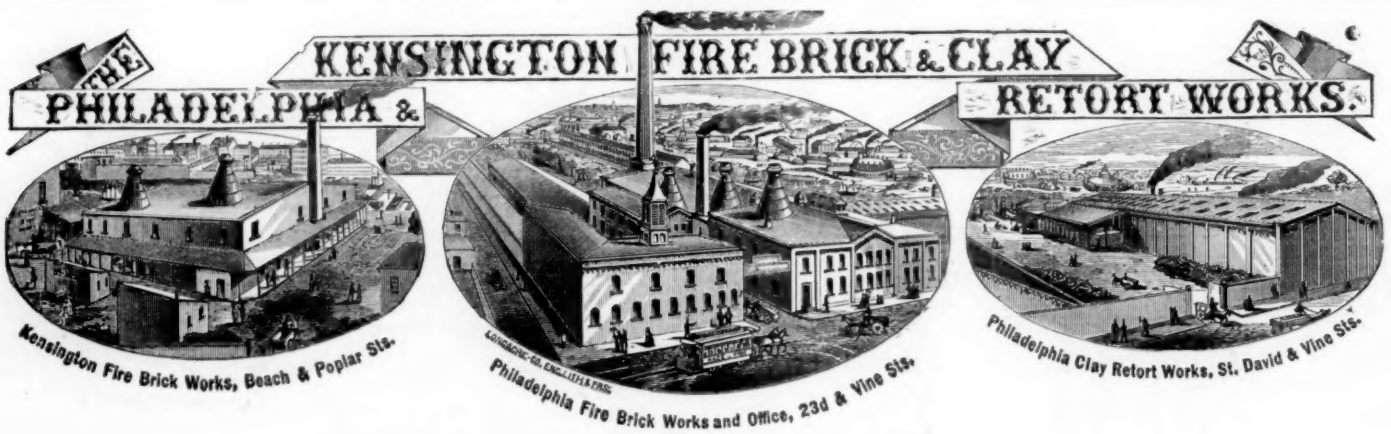
FOR WATER AND GAS,

ALSO,

AS WORKS AND MACHINERY CASTINGS

OF EVERY DESCRIPTION,

No 112 Leonard Street, New York.
RILEY A. BRICK. W. W. CAMPBELL.

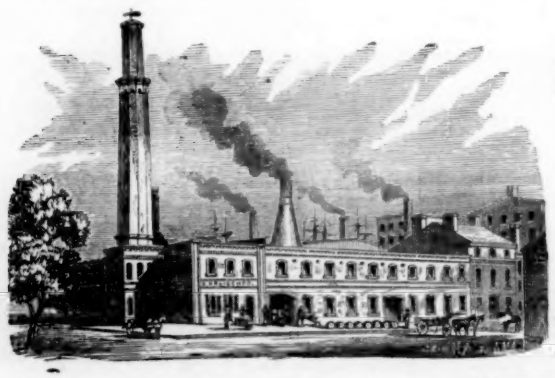

THE
PHILADELPHIA &
KENSINGTON FIRE BRICK & CLAY
RETORT WORKS.
Kensington Fire Brick Works, Beach & Poplar Sts.
Philadelphia Fire Brick Works and Office, 23d & Vine Sts.
Philadelphia Clay Retort Works, St. David & Vine Sts.

PHILIP NEUKUMET,

(SUCCESSOR TO JOHN NEUKUMET),

Manufacturer of Fire Bricks, Tiles, Gas and Sugar House Retorts.

☞ Plans of Settings for Benches of Threes, Fives, and Sixes furnished, free of charge, upon application.



NEW YORK
FIRE BRICK AND CLA
Retort Works.

☞ *Established in 1845.* ☜
(Branch works at Kreischerville, Staten Island.)

B. KREISCHER & SON,

OFFICE,
8 Goerck Street, cor. Delancy, N. Y

GAS RETORTS, TILES & FIRE BRICK
Of all shapes and sizes.

FIRE MORTAR, CLAY AND SAND.

Articles of every description made to order at the shortest notice.

J. KREISCHER & S

JOHN McNEAL & SONS,

MANUFACTURERS OF

Cast Iron Gas and Water Pipe.

Works—Burlington, N. J.

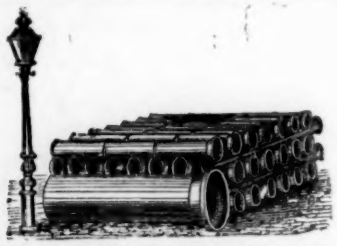
Having withdrawn from the firm of R. D. Wood & Co., the practical management of which we have had since the organization of that firm until June 1871, we have now completed our Works for the manufacture of CAST IRON PIPE and Castings generally.

Having immediate rail and water communication with New York and Philadelphia, as well as the coal and iron regions we have every advantage of situation.

Our experience in the manufacture of Pipe for a great many years, has enabled us in rebuilding to practically apply Machinery and Fixtures of the very best character, to insure *good work.*

We are now prepared to contract for this class of Castings under the most favorable terms.

Office and Works Burlington, N. J.



R. D. WOOD & CO.,

PHILADELPHIA.
MANUFACTURERS OF

CAST IRON PIPE

FOR GAS AND WATE
Lamp Posts, Valves, Etc.
Mathew's Pat. Anti-Freezing Hydrants,
400 Chestnut Street.

JAMES MARSHALL & CO.

Franklin Foundry and Pipe Works,

MANUFACTURERS OF

GAS, WATER, AND OIL PIPES,

Works, 18th, 19th, 20th and Railroad Street.
Office, No. 23 Nineteenth Street.
Pittsburgh, Pa.

B.—Pipe from 3-inch and upwards cast in 12 ft. lengths.
☞ Send for Circular and Price List.

S. DECATUR SMITH,

CAST IRON GAS and WATER PIPE,

Foundry, Cor. of York and Moyer Streets,
PHILADELPHIA.

Several Thousand 2, 3, 4, 6 and 8 Inch Cast Iron *Gas and Water Pipes* on hand, for immediate delivery.

☞ FITTINGS FOR GAS AND WATER MAINS. ☜

MANHATTAN
FIRE BRICK & ENAMELLED CLAY
RETORT WORKS.

ADAM WEBER,
(Successor to Maurer & Weber.)
Proprietor.

Office and Works, 15th Street, Avenue C.

Manufactures of
FIRE BRICK AND TILES,
Of all shapes and sizes.

FIRE MORTAR, CLAY AND SAND.

☞ Articles of every description made to order at short notice. (135

CHAS. H. MEYER & CO.,
227 Chestnut Street, Philadelphia, Pa.,
IMPORTERS OF
LAVA TIPS AND SCOTCH TIPS.

ALL ORDERS DELIVERED FREE TO NEW YORK.
359-1y

T. Dean, Pres't. } { H. N. Smith, Treas.
S. F. Dewey, V. Pres. } OFFICE OF { J. M. Ward, Sec.

THE GAS-LIGHT CO. OF AMERICA

Nos. 63 and 64 Drexel Building,

P. O. Box, 5131. NEW YORK.

THE GAS-LIGHT COMPANY OF AMERICA, owners of the Patent Processes for making ILLUMINATING GAS from PETROLEUM and its products, known as the

Gale and Rand Patents,

are prepared to treat with Gas Companies and Manufacturers of Gas for the use of said processes.

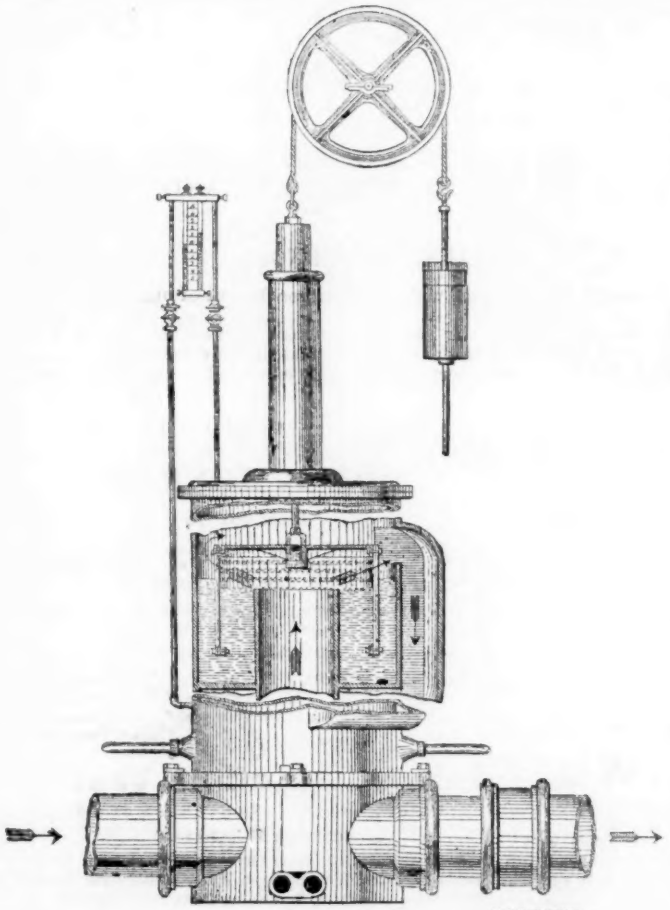
An examination of the merits of these inventions as demonstrated by practical experience in a large number of Gas Works employing them, will not fail to convince the intelligent Gas Manufacturer of the great advantages derived from their use.

Gas of unexceptional quality, of high illuminating power is made at many of these works by these processes, at a cost of from 40 per cent. to 60 per cent. less than an ordinary quality of illuminating gas can be made by any other methods in use. Gas Companies generally may easily, and at small outlay for making the necessary changes in manufacturing apparatus, double their net earnings, and supply a much better light their patrons, at greatly reduced prices.

The Company respectfully refer to Companies using these processes in this city, Brooklyn, Newark, Chicago and elsewhere, and especially to the Mutual Gas-Light Company of Detroit, Mich., whose works more nearly conform in all details of construction to the original plans of the inventors, than th one of other Companies.

orrespondence, etc., address to office as above.

JOSEPH M. WARD, Secretary



ADDRESS

OR

Sole Agency for the United States.

THE

Pelouze & Audouin Condenser.

PATENT MAY 26, 1874.

With SMEDBERG'S COMBINED BYE-PASS, REVERSED FLOW, and DIFFERENTIAL GAUGE.

PATENT JULY 21, 1874.

This apparatus is based upon the recent discovery by Messrs. PELOUZE & AUDOUIN of the principle of Condensation by impact, or percussion.

All gas-makers are aware how difficult it is to separate all the Coal Tar and Water from Crude Coal Gas by mere cooling; and how frequently these liquids are swept on to the purifiers, even where scrubbers or washers of large size and considerable cost are employed.

The PELOUZE & AUDOUIN CONDENSER completely arrests these by-products, increasing the quantity of Coal Tar available for fuel or sale, reducing the tendency of the purifying material to cake on the trays, and yielding a gas-liquor of remarkable strength. Hence, all the processes of purification are facilitated, while its simultaneous arrest of heavy percentages of Naphthaline reduces the risk of stoppages to a minimum.

The subordinate patent of July 21, 1874, combines a Bypass with the Condenser; and thus saves to the purchaser the cost and slow action of three valves, together with the space occupied by these valves and the necessary connections.

The Differential Gauge is so constructed that there is no oscillation of its water-columns; while it indicates inlet pressure, outer pressure, or back-pressure, at the will of the observer.

IT IS POSITIVELY GUARANTEED THAT EVERY CONDENSER SHALL BE OF PERFECT MECHANICAL CONSTRUCTION, AND SHALL DISCHARGE ITS FUNCTIONS SATISFACTORILY.

The Condensers are now used or ordered by the following American Gas Works: San Francisco, Cal. (3); Louisville, Ky. (2); Oakland, Cal. (1); New Orleans, La. (1); Salt Lake City, Utah (2); Philadelphia, Pa. (1); Newark, Ohio (1); Indianapolis Gas Company.

The following European Gas Works are also using the Condenser with satisfactory results:

St. Mandé; Ternes; Armint'ères; Reims; Bome; Liège; Schaffhouse; Ivry; St. Denis; Château Thierry; Douai; Florence; Berne; Loclé; Belleville; Versailles; Orléans; Courrières: Geneva; Vevey; Batavia; Frankfort-on-the-Main, and about thirty others

The Paris Gas Company, sending out a daily December maximum of about twenty-five millions cubic feet, has adopted this Condenser at each of its ten stations

JAMES R. SMEDBERG, Consulting Engineer,
San Francisco Gas-Light Company.

HENRY CARTWRIGHT, C. E., 2107 Green Street, Philadelphia, Pa.

GAS PURIFICATION.

St. John and Cartwright's
NEW IRON COMPOSITION

Has purified, per bushel, on a single test, 10,000 feet of Westmoreland Gas. With revivification lasts indefinitely. Surpasses in POWER and ECONOMY all known materials. Saves largely in FIRST COST, SPACE, LABOR, SUPERINTENDENCE, and all current expenses. Will purify *easily* sulphurous gas, wholly *unmanageable by lime.* Takes out *all the ammonia.* Now operating in the following Gas Works: Harlem' New York (21st street); Port Morris; Hunter's Point; East New York Worcester, Lynn and Cambridge, Mass.; Lewiston, Maine; St, Albans, Vt.; Pawtucket, R. I.; Meriden, Ct., and being introduced in many other places.

Cost 70 cents per bushel. One bushel for each square foot of Purifier sufficient. Rights to use for life of Patents, for daily makes of gas in thousands; under 25,000 $200; under 50,000, $400; under 100,000, $500 $250 additional for each additional 50,000 per day.

For further information and instructions, apply to

ST. JOHN & CARTWRIGHT,
21st Street and Avenue A, New York Gas Works.

☞ Immediate arrangements are urged, as the demand for the prepared composition is increasing *so rapidly* that delays n supply may occur.

GEO. STACEY. HENRY RANSHAW WM. STACEY.

GEO. STACEY & CO.,

MANUFACTURERS OF SINGLE AND TELESCOPIC

GAS-HOLDERS,

AND ALL KINDS OF

Cast and Wrought Iron Work

Used in the Erection of Gas and Coal Oil Works.

Foundry on MILL STREET; Nos. 33, 35, 37 and 39.

Office and Wrought Iron Works on RAMSAY STREET Cincinnati, Ohio.

REFERENCE.

Cincinnati Gas-Light Co.	Baton Rouge, La., Gas Co.
Indianopolis Gas Co.	Saginaw, Mich., Gas Co.
Dayton, O., Gaslight Co.	Oshkosh, Wis., Gas Co.
Covington, Ky., Gas Co.	Peoria, Ill., Gas Co.
Springfield, O., Gas Co.	Quincy, Ill., Gas Co.
Terre Haute, Ind., Gas Co.	Champaign, Ills., Gas Co.
Madison, Ind., Gas Co.	Carlinville, Ill., Gas Co.
Kansas City, Mo., Gas Co.	Bowling Green, Ky., Gas Co.
Topeka, Kansas, Gas Co.	Hamilton, Ohio, Gas Co.
Burlington, Iowa, Gas Co.	Vicksburg, Miss., Gas Co.
Nashville, Tenn., Gas Co.	Denver City, Cal., Gas Co.

R. T. Coverdale, Eng'r Cincinnati, and others.

REMOVAL.

BUTLER'S PATENT
Coke and Coal
SCREENING SHOVELS

MADE FROM BEST MALLEABLE IRON AND STEEL.

FURNISHED WITH LONG OR D HANDLES

Perfect in their operation. Is very strong, and from their great durability vastly more economical than any substitute. Refer to all the principal gas Companies in the country, who acknowledge them as the "ne plus ultra of Coke Screening Shovels.

Orders addressed only to

HERRING & FLOYD,
Sole Agents.
740 Greenwich St., N. Y.

☞ I still retain the original SABBATON LETTERS PATENT, and have granted no rights or privileges to any other parties.

NATIONAL FOUNDRY

AND PIPE WORKS.

OFFICE AND WORKS—CARROLL, PIKE, SMALLMAN AND WILKINS STREETS,

PITTSBURGH, PA

WM. SMITH,

Manufacturer of all kinds of GAS and WATER PIPE BRANCHES, CONNECTIONS, T's, ELBOWS, an all CASTINGS USED AT GAS AND WATER WORKS,

We offer special inducements to parties wishing to purchase. My Pipe is Smooth, regular in weights, and cast vercally.

N. B.—Pipe from 3 inch and upwards, cast in 12-ft. lengths.

☞SEND FOR CIRCULAR AND PRICE LIST.

PROVIDENCE
Steam & Gas Pipe Co.,

PROVIDENCE, R. I.,

BUILDERS OF

GAS WORKS

AND

GAS-HOLDERS,

RETORT HOUSE ROOFS,

PURIFIER COVERS,

COKE BARROWS,

WATER TANKS.

Particular attention given to

Enlarging and Rebuilding Gas Works.

PRINCIPAL OFFICE AND MANUFACTORY CORNER PINE AND EDDY STREETS. PROVIDENCE, R. I.

FREDERICK GRINNELL, President, J. C. HARTSHORN, Treas.
F. H. MAYNARD Secretary.

CHICAGO OFFICE, 103 WASHINGTON ST., CHICAGO, ILL

FARRINGTON & BRANCH, Agents.

S. FULTON & CO.,

PLYMOUTH IRON WORKS,

CONSHOCKEN, PA.,

Manufacturers of

PIG IRON & CAST IRON GAS & WATER PIPES, AND PUDDLED BARS.

Also, Heavy and Light Castings of every description.
242 South Third Street Philadelphia, Pa.

SAMUEL FULTON, TEO. THREWEND

1849. HARRIS, GRIFFIN & CO., 1873.

12th and Brown Streets, Philadelphia, Penna.

and 49 DEY STREET, NEW YORK CITY.

Manufacturers of WET AND DRY GAS METERS, STATION METERS, SHOW AND TEST METERS, METER PROVERS, PRESSURE REGISTERS AND INDICATORS, BAR AND JET PHOTOMETERS, WET AND DRY CENTER VALVES, and all Apparatus pertaining to Gas Works in their line.

Patentee and Sole Manufacturer of the ORIGINAL and ONLY CORRECT GAS EXHAUST GOVERNOR.

We hereby caution all parties against making, vending, or using any GAS EXHAUST GOVERNOR that will be an encroachment of our patent.

The support and confidence of Gas Companies, so long enjoyed by us, encourage us to pursue the same undeviating course that has contributed to establish the character of our house, and with our extended experience and increased facilities, develop the latest improvement that Science can apply, in the construction of Gas Meters, etc., and thereby merit a continuance of the favors hitherto so liberally extended to us, always guaranteeing satisfaction.

ANDREW HARRIS. JOHN J. GRIFFIN.

NOW READY AND FOR SALE,

FODELL'S

System of Bookkeeping

FOR GAS COMPANIES.

Price $5, which should be sent either in Check, P. O. Order, or Registered Letter.

Blank Books, with printed headings and forms on this system, will be supplied to Gas Companies, by applying to W. P. FODELL, Philadelphia, or

A. M. CALLENDER & CO.,
Office GAS-LIGHT JOURNAL, 42 Pine St., N.Y.

HERRING & FLOYD,

Oregon Iron Foundry

738, 740, 742 and 744 Greenwich St,, N. Y

MANUFACTURERS OF

ALE KINDS OF CASTINGS

AND

APPARATUS FOR GAS-WORKS.

BENCH CASTINGS
from benches of one to six Retorts each.

WASHERS: MULTITUBLAR AND AIR CONDENSERS; CONDENSERS; SCRUBBERS,

(wet and dry), and

EXHAUSTERS
for relieving Retorts from pressure.

BENDS and BRANCHES
of all sizes and description.

FLOYD'S PATENT
MALLEABLE RETORT LID.

SABBATON'S PATENT
FURNACE DOOR AND FRAME.

SELLER'S CEMENT
or stopping leaks in Retorts.

GAS GOVERNORS,

and everything connected with well regulated Gas Works, at low price, and in complete order.

N. B.—STOP VALVES from three to thirty inches—at very low prices.

SILAS C. HERRING. JAMES R. FLOYD.

C. GEFRORER,

Manufacturer of

GAS BURNERS,

GAS HEATING AND COOKING APPARATUS

FITTERS' PROVING APPARATUS. ETC.

No. 248 North Eighth Street, Philadelphia.

KIDD'S

Gas Consumers' Guide

Enables every Gas Consumer to ascertain at a glance, without any previous knowledge of the Gas Meter, the quantity and money value of the Gas consumed. Also the best method of obtaining from Gas the largest amount of its light.

It will be to the advantage of Gas Companies to supply their Consumers with one of these Guides, as a means of preventing complaints arising from their want of knowledge in regard to the registration of their meters. For sale by

A. M. CALLENDER & CO.,
42 Pine Street, New York, Room 18,

GRAHAM'S

Patent Anti-Freezing LAMP POST.

THE BEST, CHEAPEST AND MOST DURABLE POST EVER OFFERED TO THE PUBLIC.

WOOSTER, OHIO
Jan. 24, 1871.

J. W. GRAHAM,

Dear Sir: Yours of the 14th inst at hand. In reply I would say that we have tested the six anti-freezing Lamp Posts purchased from you, and find them to be all as you represented. Whilst nearly a dozen of our sixty-five Posts were frozen down last month and first of this not one of yours was affected by the heavy frost. What can you sell them at?

Yours truly,
LUCAS FLATTERY
Sec'y Wooster Gas-Light Co.

Address the Patentee,
J. W. GRAHAM,
Chillicothe, Ohio.

X 259-9t

LUDLOW

Valve Manf'g Co.,

OFFICE AND WORKS

938 to 954 River Street and 67 to 83 Vail Ave

TROY, NEW YORK.

BRASS AND IRON SLIDE VALVES.

(Double and Single Gate ¾ inch to 36 inch—outside and inside screws, Indicator etc.) for Gas, Water and Steam—

HYDRAULIC MAIN DIP REGULATORS.

ALSO

FIRE HYDRANTS.

REFERENCES FURNISHED.

SEND FOR CIRCULARS.

JOHN P. KENNEDY,

SUCCESSOR TO

Hoy, Kennedy & Co.,

GAS ENGINEER AND CONTRACTOR

For the Erection, Alteration and Extension of Gas Works.

PLANS, SPECIFICATIONS AND ESTIMATES.

Office 98 Liberty Street. P. O. Box 2,348

AGENT FOR THE

ATLANTIC DOCK

Iron & Machine Works,

FERRIS, WOLCOTT AND DYKEMAN STREETS,

South Brooklyn.

MANUFACTURERS of every kind of Gas Machinery, Retorts Bench Castings, Wrought Iron Work, Multitubular and Air Condensers, Washers, Scrubbers, Purifiers, Exhausters with every equipment complete for large or small Works, Gasholders, Telescopic or Single; Iron Roof Frames with Cornice Gutters, covered with Corrugated Iron or Slate; Iron Doors and Iron Pivot Blind Windows; Coke Barrows, Fire Tools, Retort Lids, Cotter Bars and Screws, Stop Valves, Tar Valves for Regulating Dip in Hydraulic Mains, Pressure Governors for Street Mains, and Compensators for Exhausters that are unrivalled for unvarying accuracy Steam Engines, Boilers, Etc., Etc.

Post Office Box 2,348. Office 98 Liberty st

SCHOOL OF MINES,

COLUMBIA COLLEGE,

EAST 49th STREET, NEW YORK.

FACULTY:

F. A. P. BARNARD, S.T.D., LL.D., President.
T. EGLESTON, Jr., E.M., Mineralogy and Metallurgy.
FRANCIS L. VINTON, E.M., Mining Engineer.
C. F. CHANDLER, Ph. D., Analytical and Applied Chemistry.
JOHN TORREY, M.D., LL.D., Botany.
CHARLES A. JOY, Ph.D., General Chemistry.
WILLIAM G. PECK, LL.D., Mechanics.
JOHN H. VAN AMRINGE, A.M., Mathematics.
OGDEN N. ROOD, A.M., Physics.
JOHN S. NEWBERRY, M.D., Geology and Palaeontology.

The plan of this School embraces a three years' course for the degree of Engineer of Mines, or Bachelor of Philosophy.

For admission, candidates for a degree must pass an examination in arithmetic, algebra, geometry and plain trigonometry. Persons not candidates for degrees are admitted without examination, and may pursue any or all of the subjects taught. For further information and for catalogue, apply to

DR. C. F. CHANDLER,
Dean of Faculty.

252-1y

Prof. Henry Wurtz,

Chemist and Geologist.

Offers his professional services, in the field and the laboratory, in the investigation, by the most recent and advanced scientific methods, of all questions of Water supply of towns dwellings, factories, steam-boilers, etc. Chemical Analyses of River; Lake, Spring and Well-Waters, made by the most improved methods.

Prof. W. makes a specialty of GAS CHEMISTRY, and the Analysis of Gas, Gas and other Coals, and Potable Waters. Has special laboratories and unequalled facilities for these purposes. Formerly Chemical Examiner in the U. S. Patent Office, and peculiarly competent.

SAMUEL DOWN, President. THOMAS J. EARLE, Secretary. T. C. HOPPER, General Superintendent.

AMERICAN METER COMPANY,

MANUFACTURERS OF

Wet and Dry Gas Meters (with Slide or Rotary Valves), Station Meters, Dry Centre Valves, Pressure Registers, Pressure and Vacuum Registers, Meter Provers, King's Pressure and Vacuum Gauges, Exhauster Governors, Experimental Meters, Watchman's Clocks, Etc., Etc.

☞ Sole Agents for W. Sugg's **PHOTOMETRICAL** and **ANALYTICAL GAS APPARATUS.**

A full assortment of the above kept at the Manufactories and Agencies, where orders may be addressed,

Agencies.

37 Water Street, Cincinnati.
20 South Canal Street, Chicago.
511 Olive Street, St. Louis.

American Meter Company,

512 West Twenty-second Street, New York.
Arch and Twenty-second Street, Philadelphia.
548 Washington Street, Boston.

HARRIS & BROTHER,

ESTABLISHED 1848.

PRACTICAL GAS METER MANUFACTURERS,

Continue as heretofore at the OLD ESTABLISHMENT, Nos. 1115 and 1117 Cherry Street, Philadelphia, Pa.,

To manufacture Wet and Dry Gas Meters, Station Meters, Experimental Meters, Meter Provers, Centre Seals, Governors, Pressure Registers, Indicators, Photometers, and all kinds of Gas Apparatus; Also furnish all other Articles appertaining to the use of Gas Works.

From our long Practical Experience of the Business (covering a period of 20 years) and from our personal supervision of all Work, we can guarantee all orders to be executed promptly, and in every respect satisfactorily.

J. Wesley Harris, Washington Harris, William Helme.

WILLIAM W. GOODWIN & CO.

No. 1012, 1014 and 1016 Filbert Street,

Philadelphia, Penn'a.

MANUFACTURERS OF

Dry and Wet GAS METERS, Station Meters (Square, Cylindrical or in Staves), Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, Etc., Etc., Meter Provers (sizes 2, 5 and 10 feet), Pressure Guages of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators, (sizes 4 inch, 6 inch and 9 inch), King's Pressure and Vacuum Gauges, Dry and Wet Centre Seals, Dry and Wet Governors, Exhauster Governors, Photometers of all descriptions. Letheby's Sulphur and Ammonia Test Apparatus complete—also Testing and Chemical Apparatus of all kinds, and of the most perfect description, for all purposes relating to Gas.

Goodwin's Improved Lowe's Jet Photometer.

W. W. Goodwin is the author of the History and Principles involved in the use of Lowe's Jet Photometer. Also Patentee and we are the SOLE MANUFACTURERS of the ORIGINAL and ONLY DIAL whereby the CANDLE POWER and PRESSURE can be instantly read, and all others are infringements.

Special attention to repairs of Meters, and all apparatus connected with the business.

All work guaranteed first class in every particular, and orders filled promptly.

WILLIAM WALLACE GOODWIN. [335 1y] HOWARD KIRK, Special Partner.

$30 per Dozen.

DEAN'S

NEW PATENT (1873)

Screening Scoop SHOVEL

FOR COKE, COAL, ASHES, AND OTHER SUBSTANCES.

The frames are 12 by 18 inches, with seven bars, and are made of the best malleable Iron. They can be wired between bars by an arrangement of holes a quarter of an inch apart, by an ordinary person, to screen any size substance desired. They are warranted to be the most durable and practical Screening Shovel made, or money refunded.

Reference—all New York Gas Companies and Hotels.

Price, $30 per Dozen.

Sample sent gratis to any Company, if desired.

☞ Smaller sizes on hand. Please address orders to A. SEE & SON, N. Y. Shovel Works, No. 1358 B'way, N. Y

MURRAY & BAKER,

Practical Builders,

And Contractors for the Erection of Gas Works,

MANUFACTURERS OF ALL THE LATEST AND MOST IMPROVED APPARATUS AND TOOLS FOR THE MANUFACTURE & DISTRIBUTION OF COAL GAS.

☞ WORKS AT THE RAILWAY DEPOTS,

FORT WAYNE, INDIANA.

We manufacture Bench Castings, Washers, "The Immersed Multitubular," and Atmospheric Condensers, Wet and Dry-Lime Purifiers, Dry Center Seals, Telescopic and Single Gas Holders, Wrought Iron Trussed Roof for Iron or Slate, Wood and Iron Trays for Purifiers, Coke and Coal Carts, Wrought Iron Screening Shovels and Castings, and Wrought Work of every description for Gas-Works.

As Mr. Murray is a Practical Draughtsman, we will furnish plans and specifications to parties or associations, or will wait personally upon parties contemplating the construction of new works, or the alteration or extension of old ones

The most satisfactory references can be given, if required of the experience and commercial fairness which characterizes our dealings.

We would respectfully invite Western men to call and see our patterns and works here. MURRAY & BAKER, Fort Wayne, Indiana.

B. S. BENSON.

MANUFACTURER OF

Cast Iron Pipes and Fittings,

AND

Gas and Water Mains.

All sizes from 3 to 30 inch cast vertically in 12½ feet lengths

Office & Factory 52 East Monument St.,

BALTIMORE, MD.

HILLARD & HOLLAND,

MANUFACTURERS OF

MALLEABLE IRON AND BRASS FITTINGS

FOR STEAM AND GAS.

PATENT GLASS OIL CUPS.

289-61

THOMAS T. TASKER JR. STEPHEN P. M. TASKER.

MORRIS, TASKER & CO.,

PASCAL IRON WORKS, PHILADELPHIA.

TASKER IRON WORKS, NEWCASTLE, DEL.

Office, Fifth and Tasker Streets, Philadelphia.

Office and Warehouse, 15 Gold Street, New York.

Office and Warehouse 36 Oliver Street, Boston, Mass.

Established 1821.

FOR GAS WORKS MACHINERY, ADDRESS OFFICE FIFTH AND TASKER STREETS, PHILADELPHIA.

Manufacturers and Builders of Gas Works, &c., of all Descriptions, of the Most Approved Plans.

WROUGHT IRON ROOF FRAMES.—For Slate, or Corrugated Iron Coverings, with Cast Iron Cornice Gutter. Iron Doors and Frames, Wrought Iron Pivot Blinds, Windows and all kinds of Castings and Smith Work for Buildings.

BENCH CASTINGS.—Retorts, and all Castings and Wrought Iron Work required for Setting them on the Latest Plan. Tar Gates, Wrought Iron Stand Pipes, Retort Lids, Cotter Bars, Coal and Coke Wagons, and Stokers' Tools.

EXHAUSTERS.—Exhausters and Compensators, By-Passes to pass from 4,000 to 150,000 Cubic feet of Gas per hour, with Engines, Governors, Pressure and Vacuum Guages.

SCRUBBERS.—Single or Multitubular Scrubbers, with Self-Acting Pumps for Ammonia Water.

WASHERS.—Cataract and Single and Multitubular Spray Washers

CONDENSERS.—Single and Multitubular Air and Water Condensers.

PURIFIERS.—For Purifying from 1,000 to 2,000,000 cubic feet capacity daily, with either wet or dry Lime, or Oxide of Iron, and with either Ash Rivetted or Wrought or Cast Iron Lime Sieves.

CARRIAGES.—Movable Lifting Carriages for Purifiers, arranged either for Floor or Overhead use.

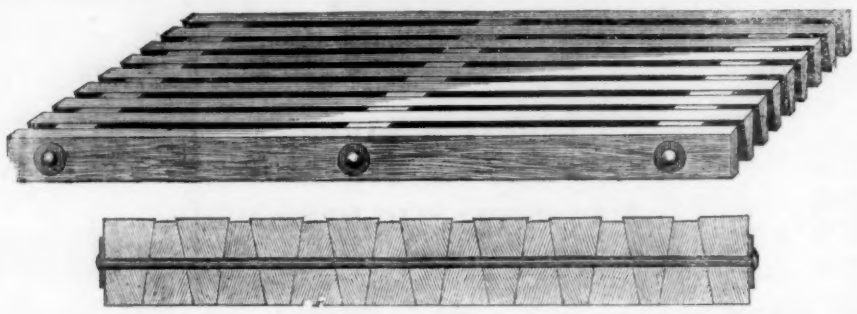
METERS.—Square and Round Meters of any capacity.

GAS HOLDERS.—Single Lift and Telescopic Gasholders, with Cast or Wrought Iron Suspension Frames.

GAS GOVERNORS.—Station Governors, with Regulating and Indicating Columns for Inlet and Outlet Pipes, also Dry Governors with Flexible Diaphragms for Underground Pipes.

STOP VALVES.—Double Faced Stop Valves for Gas or Water, from three inches to forty-eight inches diameter. These Valves are proved on both sides, with a heavy Water Pressure, Flange and Bell Pipes, Fittings and Drips of all descriptions. Steam Boilers and Hot Water Apparatus for Heating Building, and Gas Holder Tanks. Lamp Posts and Lanterns.

P. Munzinger's Patent Ash Lime Trays.



In use at the following Gas-Light Companies:

Pittsburg Gas Company, Pa.
Peoples Gas Company, Baltimore.
Lowell Gas-Light Company, Mass.
Lynn Gas-Light Company, Mass.
Albany Gas-Light Company, N. Y.
Schenectady Gas-Light Company, N. Y.
Utica Gas-Light Company, N. Y.
Jersey City Gas Company, N. J.
St. Paul Gas-Light Company, Minn.
Cumberland Gas-Light Company, Md.
Hartford City Gas-Light Company, Conn.
Richmond Gas Company, Va.
McKeesport Gas Company, Pa.
Middletown Gas Company, Pa.
East Newark Gas-Light Company, N. J.
Binghampton Gas Company, N. J.
Zanesville Gas Company, Ohio.

New Orleans Gas Company, La.
Salem Gas-Light Company, Mass.
New Britain Gas-Light Company, Conn.
Rahway Gas-Light Company, N. J.
Trenton Gas-Light Company, N. J.
Elmira Gas Company, New York.
Erie Gas Company, Pa.
Columbus Gas-Light Company, Ohio,
Westchester Gas-Light Company, N. Y.
Santa Cruz Gas Company, Cal.
Lawrence Gas-Light Company, Kansas.
Salem Gas Company, N. J.
Indiana Gas-Light Company, Pa.
Peoria Gas Company, Ill.
Montclair Gas Company, N. J.
Williamsport Gas Company, Pa.
Wooster Gas Light Company, Ohio.

Augusta Gas-Light Company, Ga.
Huntsville Gas Company, Ga.
Chattanooga Gas Company Tenn.
Murfreesboro Gas Company, Tenn.
Hagerstown Gas-Light Company, Md.
Hanover Gas Company, Pa.
Easton Gas Company, Pa.
Uniontown Gas-Light Company, Pa.
Coatesville Gas-Light Company, Pa.
Houston, Gas Company, Texas.
Wilkesbarre Gas Company, La.
Middletown Gas Company, New York.
Washington Gas-Light Company, Pa.
Princeton Gas-Light Company, N. J.
Newark Gas Company, Ohio.
Pontiac Gas-Light Company, Mich.
And numerous other Companies.